Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY,
WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico.....$5.00
Canada 6.00
Foreign Countries (excepting daily editions)..... 8.00
Single Copies .....15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue 10,150 copies were printed; that of those 10,150 copies, 8,674 were mailed to regular paid subscribers and 350 were provided for counter and news companies' sales; that the total copies printed this year to date were 285,909—an average of 8,664 copies a week.

VOLUME 55. AUGUST 15, 1913. NUMBER 7.

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*Illustrated.

ONE way in which the number of engine failures may be greatly reduced and the cost of locomotive maintenance cut down is to have complete data furnished to the mechanical engineer's office covering each defective part, whether it is cracked, broken or badly worn, and regardless of whether it caused an engine failure or was found while the engine was being cleaned or repaired. One man should be assigned to study and classify this data in order to determine just what steps should be taken to improve conditions. In some cases a radical change in design may be necessary, in others a slight change or rearrangement of the parts or apparatus may eliminate the trouble, while in still other cases it may be necessary to change the grade of material used for the purpose. Unless this is done it is quite possible on a road of average size for a given part to fail on several locomotives during a year and yet remain unnoticed because the failures may have taken place at different points, and in some cases may not have been noticed at headquarters because they did not result in engine failures. It is only by tabulating and classifying the various defects for the entire system and taking into consideration the number of locomotives on which each particular part is used, that conditions can be intelligently improved to reduce the number of failures with a minimum expenditure of the time and money to procure the best results. If records of this kind are kept and classified for a period of several years, it is possible to quickly and accurately determine just what parts can be attacked with the best results. If records of this kind are not kept, then the scrap pile offers the next best opportunity for securing information as to the failure of the various parts. This is particularly true where conditions make it necessary to ship all of the scrap which is to be sold, to one central part on the system. For instance, when the Santa Fe established the scrap plant at Corwith, Ill., those in charge noticed that as the scrap was sorted out certain parts which were used on equipment that had only been on the road for a few years, appeared in large numbers. Investigation showed that these parts had failed, due to defective design, and the purchasing agent was therefore in a position to ask the builders to furnish new parts of a better design at no expense to the railroad, thus preventing the continuance of failures and resulting in a considerable saving.

THE importance of inciting the magistrates and local authorities to make a more determined effort to reduce the trespassing evil on the railroads has been commented on many times in these columns. This seeming lack of interest may be due in some degree to the feeling on the part of the magistrates that they are dealing with a large floating class of tramps and hoboes, and that any effort on their part may not be of much avail unless concerted action is taken by the authorities throughout the country; in other words that a determined move on their part to punish offenders might result in an expense to the districts which they represent without effecting a very great improvement of conditions as a whole. The fallacy of this argument was clearly shown by F. V. Whiting, general claims attorney of the New York Central Lines, a year or so ago, when in analyzing the statistics for 1,000 persons who had been killed when trespassing, he found that practically 49 per cent. (489) resided near the place of accident, while the places of residence of 321 others were known, leaving only 19 per cent. in the hobo class, or whose places of residence could not be ascertained. These figures would seem to indicate that a disposition on the part of a magistrate to make an example of those who trespass on railroad property in his district, would, at least, have some effect on the 49 per cent. of trespassers who live in the immediate neighborhood. The New York Central has made attempts to get in touch with the magistrates along its line by furnishing them with literature on the trespass question. As far as can be seen this has not been productive of any

very important results, and it is planned to follow it up with a torney's staff. The safety exhibit car, described in last week's issue, contains an exhibit of special interest to magistrates and public authorities and an effort will be made to have them visit the car and examine it. Meanwhile, a more concerted action on the part of the railroads in dealing with this problem is promised by the appointment of a committee of the Association of Railway Claim Agents to deal generally with the trespass problem and co-operate with the General Managers' associations or the American Railway Association. While the enactment of proper legislation is necessary in some cases, experience has shown that the great difficulty is to secure a respect for the law already enacted by the punishment of the offenders; in other words, the problem is to educate the public to a state of mind where it is willing to have the law enforced. To secure the most effective results on any one road for the expenditure of a given amount of energy it might be well to concentrate on those points where the conditions are worst. In this connection the type of graphical chart used on the New York Central, which is shown on another page, is to be commended, for at a glance it may be seen just where the accidents are most frequent.

DURING his campaign for election as governor of New York William Sulzer promised the representatives of the railway labor brotherhoods that if he were elected and a full crew bill were passed he would sign it. Subsequent statements issued by Mr. Sulzer showed that he knew almost nothing about the causes of railway accidents in the United States or about the merits of full crew legislation. Nevertheless, after he became governor, in spite of the presentation to him of the most convincing arguments against train crew legislation, he kept his promise and signed a full crew bill. It is of no little significance that it is now this same Governor Sulzer of whom a legislative investigating committee reports, that he "made a false and fraudulent report to the secretary of state under his oath as required by law" as to the amount expended in his campaign for governor; "that he converted to his own private use contributions given in aid of his said election for the purchase of securities or other private uses; that he engaged in stock market speculations at a time when he was governor and vigorously pressing legislation against the New York Stock Exchange"; "that as governor he wilfully and corruptly made false public statements advising and directing citizens to suppress evidence in reference to his unlawful use of contributions made to him for campaign purposes"; and "that he has otherwise corruptly and unlawfully acted or omitted to act." As a result of the investigation and report of this committee the New York Assembly has adopted by a vote of 79 to 45 a resolution providing that Governor Sulzer "be and hereby is impeached for wilful and corrupt conduct in office and for high crimes and misdemeanors." It may be that the governor will disprove the grave charges made against him. But if he is guilty as alleged his conduct in reference to other matters has been perfectly consistent with his conduct in reference to the train crew legislation. It is alleged that he applied money that had been given to him for party purposes to personal uses. Now, in the case of the train crew matter, he used his position as governor of New York to put into effect a measure which injures the people of New York in order, evidently, to further his own political aggrandizement. This is not the first time that a public man who has professed himself an immaculate tribune of the people has promoted legislation for the benefit of certain classes of people at the expense of the whole people, and later fallen under suspicion regarding his personal probity. Only a few years ago Oklahoma had a governor who was a militantly strident self-avowed tribune of the people, and who waged remorseless, demagogic warfare on the railways. And subsequently, as an ex-governor, he was indicted for violations of a federal statute. Thus it ever was. From the young man Absalom in Israel, and Alcibiades in Greece, to the present moment there never has been a demagogue who was worthy of public confidence; and the infallible mark of the demagogue always is that he makes unjust attacks on some particular class of the public, for the pretended good of the whole public. It is one of the things that are inexplicable that even in the most intelligent nations there always is a large number, and often a majority, of the people who will for a time, sometimes for a long time, accept the demagogue at his own valuation instead of at the valuation which his professions and his conduct stamp upon his brazen forehead in letters that are so unmistakable that it would seem that even a fool need not err therein.

WE publish elsewhere in this issue a summary of the legislation affecting railway operation passed by the 42 legislatures that had sessions in 1913. The summary is from a report that has just been issued by the Special Committee on Relations of Railway Operation to Legislation. It does not encourage the belief that the mania for regulating railways has subsided. In 1911, 512 bills to regulate railway operation were introduced in the 37 legislatures that met in that year. No record was kept of the number of them passed. In 1912 thirteen legislatures met in regular session, and there were introduced 272 bills for the regulation of railways, of which 48 were passed. In 1913 there were 1,395 bills for the regulation of railway operation introduced in the 42 legislatures that met, and of these 230 were passed. It will be noted that these figures include only measures relating to operation and exclude measures relating to rates, finances, valuation, and so on. Many of them were merely measures to amend laws already in effect, but in view of the hundreds of provisions affecting railways that have been passed within recent years it would seem that the time should have come for a reduction instead of an increase in the output of the legislative mills. The continued activity of the lawmakers is doubtless attributable to three principal causes. One is the desire to promote the public welfare by passing laws which are really needed. This doubtless is what led to the enactment of amendments to a good many laws already on the statute books. This also doubtless caused the passage of the six measures relating to trespassing on railways. The second cause of a good deal of legislation is the desire of many lawmakers, by introducing bills on which their names appear as the authors, to give their constituents the impression that they are really doing something. The third and main cause of legislation affecting operation, as the compilation plainly shows, is the ubiquitous activity of the lobbies of the railway brotherhoods. It is easy enough to trace to them the legislation regarding full crews, hours of service, service letters and time of payment, terms of employment, experience of employees, headlights, and so on. The result of the working of these causes in the state houses of 42 states has been the passage of some good measures and of a very large number of provisions that are restrictive, burdensome, meddlesome, inconsistent, expensive, unjust or downright silly. Most of the bills were introduced by members who knew little about the subjects with which they dealt and were passed by members who knew nothing at all about them. There is hardly a provision in the 230 measures adopted which does not tend to increase the cost of railway operation and thereby to either reduce the net earnings of the railways or to make it necessary for them to charge higher passenger and freight rates than they would otherwise have to charge. Fair and sensible regulation of railways is desirable, but to those who study the sort of regulation actually in vogue, especially in the various states, it sometimes seems that, on the whole, it is worse for the railways and the public than no regulation at all would be.

RAPID INCREASE IN STEEL PASSENGER EQUIPMENT.

THE wonderful increase in the number of all-steel passenger cars placed in service in the country since January 1, 1909, as indicated in the bulletin of the Special Committee on Relations of Railway Operation to Legislation which is reproduced on another page of this issue, is all the more remarkable when we remember that the first modern experimental all-steel passenger car for use on steam roads was not placed in service until 1906. Prior to that time a number of designs had been developed for special purposes but not for regular through passenger traffic on steam roads. The introduction of the steel frame, side door suburban car on the Illinois Central in the fall of 1902 was probably the first move toward the introduction of steel passenger equipment in this country. Experience with a crude design of side door equipment in temporary use during the Chicago World's Fair demonstrated the value of this principle in handling suburban traffic and a steel frame was adopted for the superstructure because of its marked advantages for this type of construction. This design was followed shortly by a steel frame car designed by George Gibbs for use by the Interborough Rapid Transit Company of New York. It was desired to make it as nearly fireproof as possible, but a large amount of equipment was needed in a very short time and market conditions were such that it was impossible to obtain the desired amount of steel for an all-steel construction.

The Pennsylvania Railroad officers became interested in the development of an all-steel car at about that time because of the necessity of providing fireproof equipment for the tunnels under the North and East rivers, which were at that time in contemplation. President Cassatt therefore offered the assistance of the mechanical department of that road and a design for a sample steel car was developed and the car was completed at Altoona about 14 months after work on the design was started. This car was placed in service on the Second Avenue Elevated Line. The design was modified somewhat and in 1912 300 cars were built from the new design to be used in the New York subway. These cars contained only 680 lbs. of wood, all of which was fireproof, and in a second lot of cars which was built a short time later most of the wood was replaced by aluminum castings. Within the next year or two a number of steel passenger cars were designed and built, more particularly in connection with special service in the subway or with the electrification movement in and about New York. These included cars for the Long Island suburban traffic, the Philadelphia subway and the New York Central suburban traffic.

The first experimental cars for through passenger traffic on steam roads were built by the Pennsylvania Railroad at Altoona and the Southern Pacific at the Sacramento, Cal., shops. These were both built in 1906. It was not until the middle of 1907, however, that the first real move toward the introduction of the all-steel car for passenger service was made. At that time the Pennsylvania Railroad placed an order for 200 of these cars. The report of the Master Car Builders' committee on steel passenger cars at the June convention, 1908, showed that up to the time that the report was prepared, probably during the latter part of March or April, there were in service on the Interborough Rapid Transit and the Hudson & Manhattan, 390 all-steel cars; in suburban electrical service there were 135 all-steel cars on the Long Island and 125 on the New York Central & Hudson River; in steam railroad service there were 17 all-steel cars, including five passenger coaches, one sleeping car and 11 all-steel postal, baggage or express cars, the first all-steel baggage car having been placed in service by the Erie Railroad in June, 1904. There were also a large number of all-steel passenger equipment cars in process of building for the Pennsylvania Railroad, including 154 passenger coaches, 22 baggage cars, 10 dining cars, 14 postal cars and five passenger-baggage cars. The Long Island was also having built 50 suburban all-steel passenger cars. The wonderful progress which was made within the next few months is indicated by the fact that the report of the Special Committee on Relations of Railway Operation to Legislation shows that there were 629 all-steel passenger cars in service on the steam roads of this country on January 1, 1909, and that during the next four years to January 1, 1913, this number was increased to 6,642, or over 1,000 per cent. Another remarkable feature of the report is that on January 1, 1913, there were 1,649 passenger cars under construction, of which 85.2 per cent. were to be all-steel construction and only 3.3 per cent. of wood.

The development of these cars has been so rapid that in some respects they may be said to still be in an experimental state. Their behavior in rough service and wrecks has indicated their value from a safety standpoint, although there is still a considerable question as to the best type of design to properly dissipate the end shocks and afford the greatest protection to the passengers. With this in mind, several improvements have been made in the end construction, and the result of these will be watched with considerable interest and may lead to modifications in future designs. The prophecy of early designers to the effect that a time would come when steel passenger cars could be made as cheap as those of wood has come true, and while data is not yet available it is probable that the cost of maintenance of the steel passenger cars will be less.

The most troublesome problem in steel passenger car design at the present time is that of properly heating and ventilating the cars. It is necessary that the metal lining which is riveted to the framing and which is an advantage from the standpoint of strength, weight and cost, should be properly insulated so that heat may not be lost from the car by conduction during cold weather. That the railroads are to be commended for the rapidity with which steel passenger equipment has been introduced is indicated by the fact that five years ago, although there were only 17 all-steel passenger equipment cars in use, two-thirds of which were for postal, baggage or express service, today many of our roads use nothing but all-steel or steel underframe equipment on their high class passenger trains.

A QUESTION FOR THE LOCOMOTIVE ENGINEER.

THE locomotive runner should keep a perfect lookout. Every now and then the investigation of a collision or a derailment brings out the need of some system by which the runner can more surely keep an adequate lookout at every point throughout a run. A notable case was that on the Cincinnati, Hamilton & Dayton reported last January (*Railway Age Gazette*, page 92). To keep a vigilant eye on the track and signals throughout every foot of a run—as is highly desirable, if not absolutely necessary, and as would be done if, on a crooked road, at night, there were a possibility of finding a landslide every 50 rods—is, in the great majority of ordinary runs, a severe strain on the mind; for with long stretches where a few seconds' inattention does no harm, and with the varied distractions of duties connected with the boiler or the fire, or of necessary conference with the fireman, or of mere involuntary wandering of the mind, the most systematic mental discipline seems to be not entirely sufficient. How is the proper habit acquired? Every engineman desires, of course, to make a perfect record for safety; and every superintendent desires to have enginemen who can be depended on to carry out such a purpose in the most effective way.

Taking it for granted that some enginemen understand how to do this better than others, and that all desire to perfect themselves, we offer a prize of fifty dollars to the man who will write the best paper on the subject. The paper should be not over 1,500 words in length and should reach the office of the *Railway Age Gazette*, New York City, by October 15. Papers which do not take the prize, but which are used, will be paid for at our regular rates. Writers must tell the editor, briefly, what their experience has been; and preference may be given to those who have had most experience as engineers on fast trains. Also, narratives of actual experiences are desirable. To describe a mistake, or a narrow escape from one, may be the best means of safeguarding others against making the same kind of mistake; and should be useful

in illustrating the writer's recommendation as to how to avoid repeating it. In cases where a writer tells of his own mistakes, the matter can be published without giving the author's name. An engineer could send two papers, one to be published with his name and one without it.

THE NEW RAILWAY MANAGERS AND THE PUBLIC.

THE retirement of Mr. Mellen as president of the New York, New Haven & Hartford will mark an epoch in the history of railways in this country. Formerly the managers of railways regarded themselves as occupying positions substantially similar to those of the managers of other large concerns. They considered that it was their main, or almost their sole, function to earn profits for their employers. The law regarded railways as public servants. The managers recognized the theory, but to a large extent ignored it in practice. They submitted to the letter of legal provisions regarding rates and service, only in the measure that these were vigorously enforced by unusually energetic and aggressive public officials. But they often did not conform even to the letter of the statutes; and very commonly they violated the spirit of their function of public service.

During the last ten years, under the pressure of public regulation and public opinion, the attitude and conduct of railway managers have been undergoing a remarkable change. This has been due in no small measure to changes in the personnel of the managers. Some of the older leaders of transportation have demonstrated their statesmanlike qualities by adapting themselves to the changed conditions. Many of them, either in the ordinary course of events or owing to the development of conditions to which they could not adapt themselves, have been retired. There has, consequently, sprung up a new generation of managers—some of them new only in the adaptation of their policies to the spirit of the time, many of them, as managers, new in fact. The members of this new generation are animated not only by the desire to earn profits for their employers—a desire without having which in large measure they would be commercial eunuchs—but also by the desire to perform fully and loyally their function as servants of the public. They recognize the difficulties in the way of performance of their dual duty, but they accept unreservedly its responsibilities.

Mr. Mellen belonged to the last generation of the railway managers. Able and ambitious, he proved himself incapable of performing the functions of a public servant. Perhaps his deficiency was not so much lack of ability to do the work of a public servant well, as lack of ability to do it satisfactorily. At any rate, he showed such lack of capacity for adapting himself to contemporary conditions that it became evident to everybody else long before it did to him that his days as a railway manager were numbered. His retirement will mark the abdication of the last of the railway czars. It will be of no less significance in the country as a whole than in New England, for it will eliminate the last of the managers whose ability as executives was equaled by their ability to arouse antagonisms almost, if not quite, as inimical to the interests of the railways as downright inefficiency in operation. The changes that have been occurring in the personnel of railway managers could not be more strikingly illustrated than by the differences between the characteristics and methods of Mr. Mellen and of those who are to succeed him in the management of the transportation system of New England. Mr. Elliott, Mr. Hustis and Mr. McDonald are typical of that fine race of American railway officers who unite to great executive ability a conception of public duties and a disposition to live up to it, which were almost unknown not many years ago.

It is a question of vital importance whether the public fully appreciates the changes that have been occurring in the personnel of railway managers and in their attitude toward the public. Unless the public does appreciate these changes it will not sufficiently modify the policy it has followed with reference to railways during recent years. And if the public attitude and policy are not to be greatly changed there is serious trouble ahead for the railways and the country. To sum up the situation in a word: will the public call off the railway baiters for a while and give the new generation of railway managers a fair chance? There is no doubt that the sentiment of the public toward the railways has softened very much. Unfortunately, while the public is no longer urging forward attacks on railways it is not requiring them to be stopped. This is clearly shown by the statistics regarding the number of laws to regulate railway operation which have been passed by the state legislatures during the present year. Most of these laws are harmful to the railways and do the public no good. The public has compelled the railway managers largely to reform. When, if ever, is it going to compel the law makers and administrative public officials to reform? When is it going to recognize the fact that by permitting legislatures and railway commissions to impose numerous unnecessary restrictions and burdens on railway companies it is permitting them to make it impossible for the new generation of railway managers to live up to the modern conception of the function of the railway manager as a public servant?

The public is often strangely forgetful of the fact that it, as well as the individuals composing it, has duties and responsibilities. However, the situation does not afford ground for pessimism. Public officials always lag somewhat behind public opinion. The change in public opinion with reference to railways seems to be unmistakable; and, perhaps, in due time the conduct of the servants of the public will catch up with the views of the public.

THE TRAIN DESPATCHER AND THE BLOCK SYSTEM.

A PERSON who sits on two stools is in danger of falling to the ground. This has been illustrated many times in train management. A conspicuous example is found in the practice of many American railroads which use the manual block system on single track but which, for protection against butting collisions at meeting points, depend in part on the train despatcher. The rules do, indeed, provide for all possible conditions, and the weakness due to a division of responsibility is in most cases hard to locate and define; it is not often susceptible of proof. And yet the feeling that it exists is very definite. Station operators do not exercise the cautious vigilance that they would if they knew that everything depended on themselves and there were not a despatcher also on guard. Despatchers, no doubt, relax, knowing that the station-to-station blocking constitutes one more safeguard against collision. It is rare that an experienced despatcher will deliberately put undue dependence on a station operator, for the despatcher's mind exercises caution automatically. But cases do occur. What seems to be a case of this kind is reported by the Interstate Commerce Commission in the Brant collision, noticed in this issue.

This *seems* to be a case of the elusive fault which we have mentioned. We cannot say positively that it is, for the report does not elucidate the details with sufficient fullness to enable one to draw a conclusion. And this difficulty of getting governmental (or railroad) investigators to air the facts thoroughly in cases of this kind is one of the reasons why the adoption of the block system, in its completeness, is the only remedy for the collision disease that can be recommended unreservedly. It is conceivable that, with certain improvements in personnel, the arrangement of meeting points on single track could be made tolerably safe without incurring the expense of the block system; but as nobody who has the power will go into the subject deeply enough to warrant safe conclusions as to the character and extent and feasibility of the improvements needed or desired, the simpler remedy, the block system, is the only resource.

Not all of the circumstances of this case are clouded, how-

ever. The government investigator says that the despatcher disobeyed a rule requiring him to send the order simultaneously to both trains. No rule of any railroad requires this. Simultaneous sending is required "if practicable." What the investigator means, no doubt, is that the order should have been written in the same words for both trains. Apparently the despatcher, to save a little time, transmitted to the westbound train, No. 11, only a part of the order which was sent to the eastbound, No. 12, omitting parts that did not affect No. 11. In doing this he, in effect, *made a new order*. This is not stated explicitly, but as both the long and the short order are spoken of as "Order No. 4," this is the only conclusion that can be reached. Evidently, there is needed a rule that in transmitting orders to opposing trains the despatcher shall read from the same paper, *and read the whole of the same paper*, for each of the two trains. Errors of despatchers are supposed to be checked by the repetition of orders by receiving operators. The present report is silent on this point; but the many difficulties which have been encountered in this matter in the past suggest that counting the words, as is done with paid messages, would often be a safeguard against errors like that which was made in this case.

Another safeguard which ought to be regularly employed is the practice of beginning a new paragraph for each movement in an order. This is a simple thing to do, and an effective safeguard; but few, if any, superintendents have had the persistency to enforce it uniformly. The difficulty of securing attention to a simple improvement in the despatching system is one of the reasons why the system as a whole has been condemned.

Neither is all of the station operator's negligence obscure. The report does not say so, but it is evident that the operator, when he gave a clear signal to the westbound train, omitted the simple, but imperative, routine procedure of looking at his train sheet. Passing over all consideration of this feature, the report goes on to say that automatic signals are safer than manual. This is true enough, as a general proposition; but the immediate question is not so general. The question is whether the operation of the manual system can be improved. During the one, two, five or ten years that must elapse before money can be found to install automatic signals it is the duty of the railroads to enforce the space interval system in the next best way, that is, by the manual block system.

Obviously, there is a question of discipline and training to be settled, as regards this operator, whatever may be the character of the block signaling rules. And in the matter of the concurrent neglect of the despatcher and the operator there is the harder question, alluded to in our opening paragraph, of insuring that neither shall relax his vigilance because of an unauthorized dependence on the other. To guard against this danger is not impossible, for experiments on the Erie and the Northern Pacific have demonstrated that in the ordinary practice there is much to be desired; but, as intimated above, the only generally accepted remedy for the weaknesses of the despatching system is the full adoption of the block system; and on single track this usually means automatics.

The Interstate Commerce Commission's report is incomplete in certain details, as we have pointed out. It is also incomplete in another feature; that wherein it says of the despatcher that "he was not in physical condition for the proper performance of his duties." What was the matter with him? This is a grave question. Many readers will read between the lines and conclude that he was under the influence of liquor. If such was the case the report should give the facts. If such was not the case justice to the despatcher demands that the facts be stated. And the station operator's record is clouded by a statement about the use of intoxicants. The report ought to say whether this cloud merits consideration at the present time. With railroad superintendents all over the country constantly wrestling with the difficulties of the liquor question, a policy of silence has nothing to commend it.

Letters to the Editor.

BEING PREPARED WHEN SAFETY FAILS.

Kingston, N. Y., July 28, 1913.

To the Editor of the Railway Age Gazette:

The efforts of safety committees on railways throughout the United States, and the results secured by them, deserve nothing but praise and commendation. In spite of all efforts to promote safety, however, accidents do sometimes occur and the provisions for alleviating suffering resulting from such accidents are in too many cases insufficient. Most railroad men have witnessed scenes of terrible suffering without having at hand any means of lending aid until a physician could arrive, which in many cases is too late to save life. Every railroad man cannot be a doctor, but if general instructions were issued as to first aid measures and certain employees provided with emergency sets, a great deal could be done toward alleviating pain and possibly saving life.

The first aid instructions could be printed in pamphlet form with heavy covers and should be of a convenient size to be carried in the coat pocket for reference at any time. The emergency sets should be complete enough and still simple enough to allow an employee with a set of instructions to perform any of the well known first aid measures that are often so important.

Jos. J. Morgan.

DESIGN OF CONCRETE TIES.

New York, May 9, 1913.

To the Editor of the Railway Age Gazette:

In the *Railway Age Gazette* of April 11, 1913, Paul M. La Bach, dwells on the question of reinforced concrete ties. His sketches and the technical part of his letter show that Mr. La Bach understands the matter thoroughly. I may, however, be permitted to add that the reason why concrete ties tested heretofore have failed, is the lack of what I believe to be the most important part of the reinforcement next to the longitudinal bars. So far as I know, this auxiliary reinforcement is not provided in any of the ties that have been tested thus far. This reinforcement consists of hoops or spirals which tie the concrete under the base of the rail together and reinforce it laterally and corresponds to the hoop or spiral reinforcement of columns which is well known in concrete building construction.

It has been shown by numerous tests of columns that the concrete under sufficient loading swells; that is to say, it expands laterally before it fails completely by crumbling. The mission of the hoops or spirals in columns is to prevent this swelling of the concrete, and it is a well known fact that columns thus reinforced have about twice the carrying capacity of columns reinforced longitudinally only. It seems to me that the same action must take place in cross-ties. The concrete under the rails is exposed to heavy pressure and pounding, and unless strongly reinforced there, it soon goes to pieces, owing to expansion and, finally, crumbling. Therefore, concrete ties should be substantially tied together by hoops or spirals. Photographs and reports on concrete ties that I have seen in various publications seem to prove the correctness of my deduction, inasmuch as they show that most ties have failed by longitudinal splitting or crumbling of the concrete under the rails, which would undoubtedly have been avoided by properly tying the concrete together. Concrete reinforced and tied together in all directions so that any possible tension or expansion stresses will be taken care of by steel, resists the most severe vibrations and shocks remarkably well. Concrete ties have fallen into bad reputation, because so many faulty designs have been tested and, of course, found wanting.

K. R. Schuster.

RECLAIMING SCRAP ON THE SANTA FE.

Material Valued at Half a Million Dollars Reclaimed During 1912-13 at the Shops for This Purpose at Corwith.

Ten years ago the highest average price for No. 1 railroad wrought scrap during any one month was $20.40 per net ton at Chicago. The highest last year was $14.25. This ratio is substantially the same for other classes of scrap and the reduction has been gradual. A few years ago the railroads, beginning to feel this reduction began to watch the scrap pile more closely. It was found that considerable usable material could be reclaimed at a very small cost, and reclaiming shops or scrap docks have been established on many roads. The most extensive plant is that of the Atchison, Topeka & Santa Fe, located at Corwith, Ill, near Chicago. It was originally simply a collecting depot for the scrap on the Santa Fe system, the scrap being hauled to Chicago because there was practically no market west of that place. But as the possibilities of the amount of material that might be reclaimed have been realized, this scrap yard has been enlarged and buildings have been erected and machines installed until now it represents the most complete plant of its kind in this country; improvements and additions are still being made. The main shops of the reclaiming plant are shown in Fig. 1.

During the year 1912 there were 143,142 tons of scrap handled at Corwith, at a total cost (including all charges) of $50,063.67. The scrap sales amounted to approximately $1,000,000 and the value of the materials reclaimed from the scrap was $421,497.48; this was handled or made serviceable for use at a cost of $53,766.81, or at the rate of $12.76 per $100 reclaimed. This is truly a wonderful return on the money invested. The growth of the plant is indicated by comparing the above figures with those for 1911, when 140,018 tons of scrap were handled at a total cost of $50,931.45, from which $367,727.45 worth of material was reclaimed at a cost of $10.03 per $100. While it appears that the rate of cost of reclaiming was less in 1911 than in 1912, it will be seen that material of a greater value was obtained in 1912, which would indicate that more expert labor was required to do the reclaiming. Investigation showed that to be the case. The material reclaimed during the fiscal year ending June, 1913, amounted to approximately $500,000.

Before going further it must be clearly understood that the material received at Corwith is absolutely scrap material, i. e., material that cannot be used without extensive repairs, and in anticipating the question concerning the disposition of the usable material it may be said that about $50,000 worth of such material is reclaimed at the local shops throughout the system each month.

The following table will give an idea of the amount of material and the value of the more important items handled at Corwith:

SCRAP HANDLED DURING 1912.

Miscellaneous scrap	75,000 tons
Rail	9,569 tons
Miscellaneous brass scrap	2,193 tons
Hose	193 tons
Hose fittings	11 tons
Rope	41 tons
Babbitt	156 tons

MATERIAL RECLAIMED DURING 1912.

	Number.	Value, New.
Tie plates	9,907	$1,519
Track spikes	1,110 kegs	3,996
Nuts	283,650 lbs.	6,750
No. 2 track shovels	3,587	1,937
Scoops	600	222
Tamping picks	9,307	5,025
Brake beams	6,293	17,254
Track jacks	807	4,000
Norton jacks	324	4,652
Track drills	317	5,397
Wheelbarrows	75	203
Switch stands	..	5,400
Angle cocks	610	
Miscellaneous valves (¾ in. to 4 in.)	5,626	
Miscellaneous bolts	2,307,354	
Warehouse trucks	389	
Couplers (to be filled in by oxy-acetylene process)	1,000	
Steel wheels (re-tiring)	4,500	
Round and flat iron	20,000 tons to be re-rolled	

Another important feature of the reclaiming at Corwith is the replacement of defective material. All the material is carefully inspected before it is sold as scrap, and a good deal of it is found to have builders' defects. An example of this is shown in the illustration of the cylinders, Fig. 2; the group in the foreground has been picked out from the rest waiting for inspection by the builder and will be replaced. Couplers, bolsters, and other material have also been found with such defects and have been replaced by the builders.

COLLECTION AND CREDITS.

The scrap is shipped to Corwith from all over the system as fast as it accumulates in carload lots; the scrap along the line is picked up each month by the supply trains. There is no sorting done outside of Corwith, except when the scrap is being loaded at terminal points where workmen from the mechanical department assist the store department in loading so that they may retain any serviceable material that has found its way to the scrap pile. There is, however, a further exception with regard to the rail. All rail except that from southern Kansas and Illinois, is sent to Newton, Kan., where it is sorted, the usable rail being held for re-rolling or drilling at that place, and the scrap sent to Corwith for sale. In southern Kansas and Illinois the usable rail is sent to Newton and the scrap direct to Corwith to prevent back hauls.

About 95 per cent. of the scrap which comes into Corwith from off the line is loaded in foreign coal cars which were originally loaded west to Texas, New Mexico, Arizona and California with oil well casing, pipe, supplies, etc. These cars, were it not for the scrap coming to Corwith, would probably have to be hauled back empty. These same cars are used to load the scrap when it is ready to sell, so that it can be readily seen that only 5 per cent. of the scrap is handled in Santa Fe cars.

As the miscellaneous scrap is taken from each division, that division is credited with a fixed scrap price of $10.31, and later if the scrap is sold at a different price that division is again credited or debited, as the case may be, with the difference. The total scrap credit, however, that is given to each division and balanced against the operating expenses consists of the above, plus the value of the defective material replaced by manufacturers, plus the difference between the market price of the reclaimed material and the cost of reclamation, together with the scrap value of the reclaimed material. This scrap credit is then proportioned to the various operating accounts as follows:

	Per Cent.
Track fastenings	5
Bridges	0.5
Signal department	0.5
Telegraph department	0.5
Buildings	1.5
Track tools	0.5
Engine repairs	28
Passenger cars	7.5
Freight cars	52
Work cars	2
Shop machines and tools	1.5
Train supplies	0.5
	100

These proportions were determined from the operating costs of a period extending over three years. This allotment of scrap credit is carried still further to each individual unit, such as each locomotive, by distributing the pro-rated amount given to that individual account to each individual unit represented in the

account in the same proportion as the cost of repairs on that unit bears to the total amount spent on that account. In this way the operating accounts are directly benefited by the value of the scrap obtained from repairs, as they should be.

SCRAP YARDS AND HANDLING OF SCRAP.

Corwith, Ill., where the scrap dock is located is on the main line of the Santa Fe, about 6 miles south of Chicago. It covers an area of about 25 acres, and is equipped with the following reclaiming shops:

Wheel and rolling mill shop	40 ft. x 274 ft.
Bolt and blacksmith shop	40 ft. x 290 ft.
Storehouse	28 ft. x 276 ft.
Hose house	28 ft. x 80 ft.
Brass house	40 ft. x 100 ft.
Valve and spring shop	24 ft. x 180 ft.

These buildings were made largely from scrap lumber obtained from all over the system and were put up by the work-

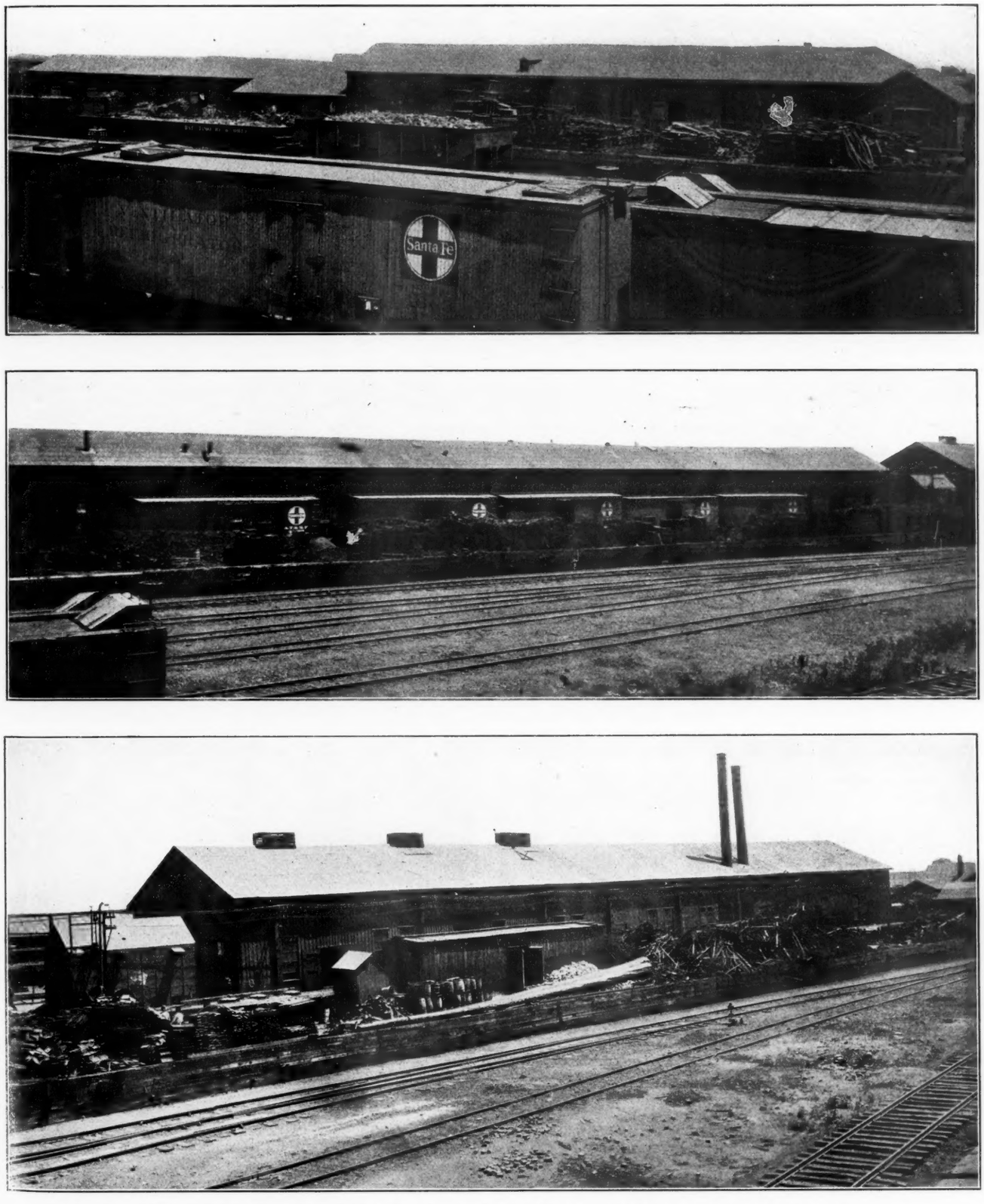


Fig. 1—Main Shops for Reclaiming Scrap at Corwith, Ill.; Atchison, Topeka & Santa Fe.

men at the plant. There are about 375 men employed, most of whom are unskilled laborers. There are, however, a few skilled mechanics for special work, such as repairing triple valves, mounting car wheels, turning tires, etc. Four locomotive cranes are used throughout the yards, three of which are equipped with lifting magnets, and the fourth with a clam shell bucket. These cranes are an important item in the handling of scrap, and cost to operate only five cents per ton of scrap handled. As they are constantly required for unloading and loading the cars, they switch the cars to the loading and unloading points instead of requiring the services of a separate switch engine.

Fig. 2—Scrapped Cylinders; Those in the Foreground Are Held for Inspection by the Builder.

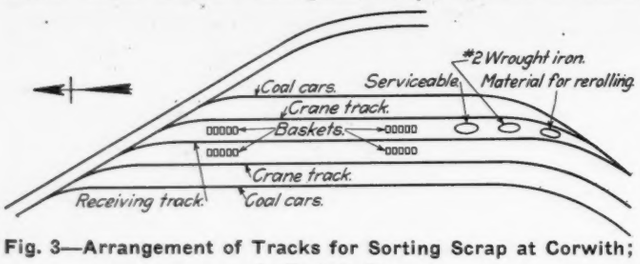


Fig. 3—Arrangement of Tracks for Sorting Scrap at Corwith; A., T. & S. F.

The pile just to the right of the flat car is usable material.

Fig. 4—Method of Sorting Scrap from the Cars.

The carloads of scrap received at Corwith are first weighed and then placed on the receiving track, which is the middle track shown in Fig. 3. From the cars it is sorted into its various classes by a gang of about 80 men, iron baskets being placed on both sides of the track for the different material.

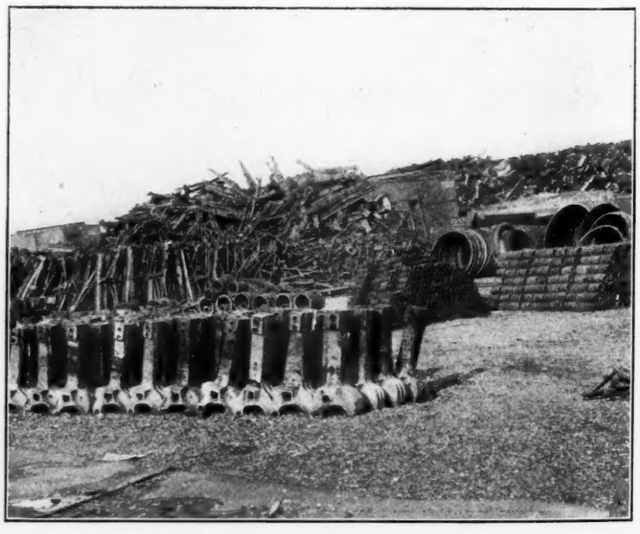


Fig. 5—Assorted Scrap Material Awaiting Inspection and Repairs.

The tracks on both sides of the receiving track are used for the cranes and flat cars on which are loaded the baskets containing the scrap that is to be held for future sale. The scrap ready for immediate sale is dumped directly into coal cars on the outside tracks and is shipped to market as soon as a carload has accumulated. The full baskets on the flat cars are shifted to the various classified piles awaiting sale, or to the shop for

reworking. The different classes of scrap into which all the mixed scrap is divided as it is taken from the cars are as follows:

Burnt cast iron.	No. 1 wrought iron.	Spring steel.
Black cast iron.	Brake shoes.	Springs that are good.
Long pipe.	Axle butts.	Knuckles (good).
Short pipe.	Malleable iron.	Knuckles (bad).
Soft steel.	No. 1 sheet iron.	Drawbars (good).
Tool steel.	No. 2 sheet iron.	Drawbars (bad).
Bolts.	No. 2 wrought iron.	Borings.

Many of these are classified still further prior to sale. The brass scrap is shipped to Corwith in locked box cars, but that

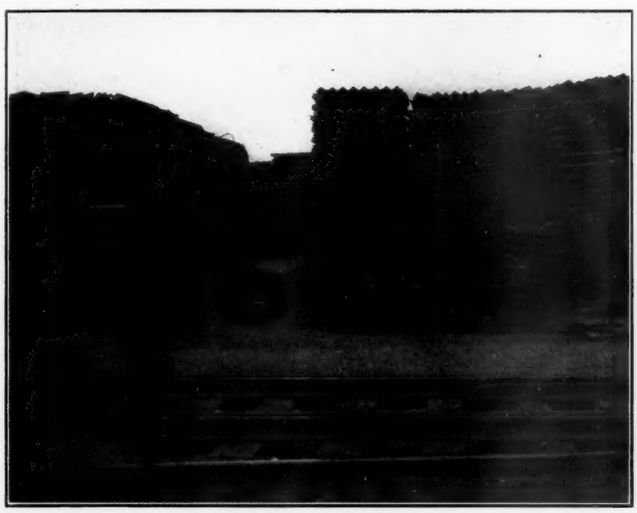


Fig. 6—Rail Angle Bars Obtained from the Scrap Pile.

which accidentally finds its way to the miscellaneous scrap is sorted and placed in separate piles, being collected frequently by means of a wheelbarrow. Any material having brass attached to it is placed in a separate pile and the brass is removed. The serviceable material, the No. 2 wrought iron and the material to be rerolled, is thrown to one side and piled as indicated in Fig. 3. All the shovels and track forks with

Fig. 7—Steel Wheel Centers Held for Re-tiring.

broken handles are placed in another pile and the old handles are burned off. As it is impossible to have a bucket for each material within throwing range of each car, piles are made in the cars themselves, as shown in Fig. 4, at the right, the cars later being switched to the various piles and unloaded by a locomotive crane. The iron baskets used for collecting the scrap are cut from the scrapped fireboxes by the oxy-acetylene process. Figs. 5, 6, 7, 8 and 9 show various groups of the material taken from the scrap. The couplers and bolsters shown in Fig. 5 are to be examined for cracks and breaks, and those that cannot be repaired by being filled in by the oxy-acetylene process will be scrapped. The springs are taken to the spring shop and tested, and if found fit for service are retempered; if not, they are uncoiled and made into jimmy bars, claw bars, etc. The brake beams are carefully inspected and those needing repairs are sent to the smith shop where a force of 12 or 15 men is constantly employed in putting in new struts and brake heads. The driving tires shown at the right in Fig. 4 are also inspected and those found serviceable for light power in switching service are made use of. As many as 170 have been reclaimed in one month.

A pile of spikes that have been reclaimed from the No. 2 wrought iron scrap and several barrels of nuts are shown in

Fig. 8—Track Spikes and Barrels of Nuts to Be Reclaimed.

Fig. 8. The spikes are first rattled and cleaned of rust, and then straightened and sharpened under a small belt hammer. Nuts were retapped at a net saving, during the month of May, of $616.80 for 162 kegs.

A pile of usable material and long iron for re-rolling as it is sorted out from the scrap cars is shown in Fig. 9. A pile of scrapped rail ready to be sold is shown in Fig. 10.

As stated in the first part of the article the reclaiming plant has grown rapidly in the past two years, and it is only now that

Fig. 9—Usable Material and Rods for Re-rolling Found in the Scrap Pile.

it is able to handle the scrap as it is received. It was therefore necessary to store the scrap in a heterogeneous heap, as shown in Fig. 11. These heaps are, however, being rapidly cleared up in the manner shown in the picture.

RECLAIMING PLANT.

The equipment of the shops for reclaiming the material is most complete. A very few new machines were purchased for these shops until recently, when it was found necessary to furnish better machines in order to do the class of work required. The re-

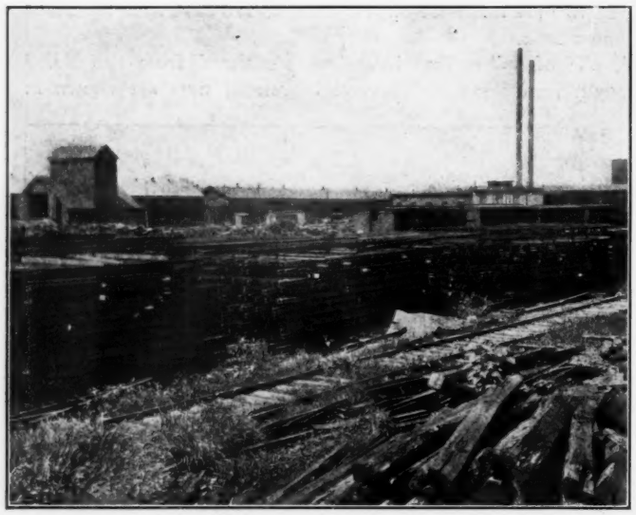


Fig. 10—Scrapped Rail Ready for the Market.

rolling shop is equipped with a large Williams, White & Company shear, shown in Fig. 12, which will shear a 1½ in. plate, 60 in. wide, or a 1¼ in. plate, 100 in. wide. This machine is used for cutting the heavy rods and flat iron. The rolling mills are shown in Fig. 13; the one in the foreground is used for rolling 3½ in. stock to 2 in., and is operated by a 100 h. p. motor. The second mill is used for rolling 2 in. stock down to ½ in. and is operated by a 50 h. p. motor. During the month of May 125 tons of material was re-rolled by the small rolls, the other rolls not having been installed, with a net saving in the cost of material of $1,514.34, or a saving of $12.12 per ton. With the new mill in service, and as the workmen become more accustomed to the work, a greater saving will be made, and three or four times as much tonnage can be handled. The rods are heated for rolling in the soft coal furnaces at the left of the rolls.

The rods from the rolling mills are cut to length in a No. 6 and No. 8 Whiting double shear and formed into bolts on two 1½ in. Acme, one 2 in. Ajax and one 3 in. Acme bolt heading machines. They are then threaded on six 3-headed Acme and two 3-headed Landis bolt threading machines. While all of this equipment was

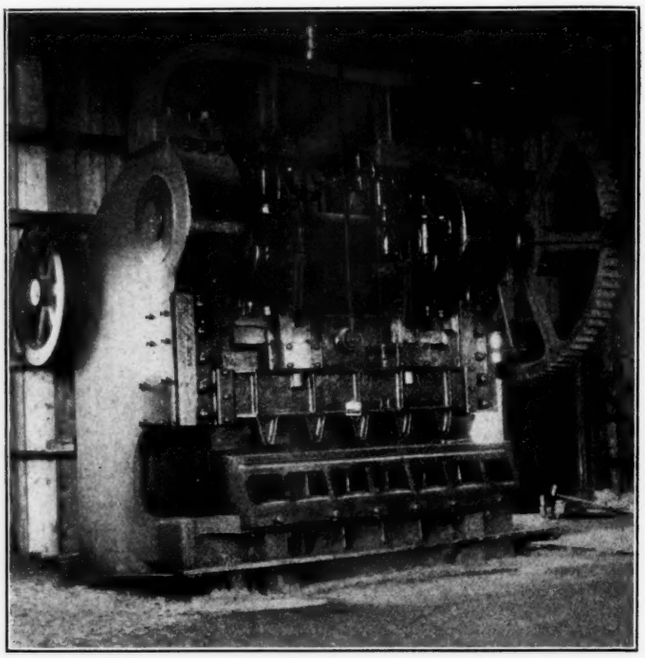


Fig. 12—Large Shears for Cutting Heavy Rods and Bars for Re-rolling.

not in service last May, there were 333,790 bolts made during that month at a net saving of $4,102.15. Fig. 14 shows the south section of the bolt shop. An extension has been built on the left for additional machines.

A very material saving is also made in re-tiring the steel wheels that are standard on the Santa Fe lines. These wheels were previously sent to the Standard Steel Works Company at Burnham, Pa., for re-tiring at a freight charge of $6 a wheel;

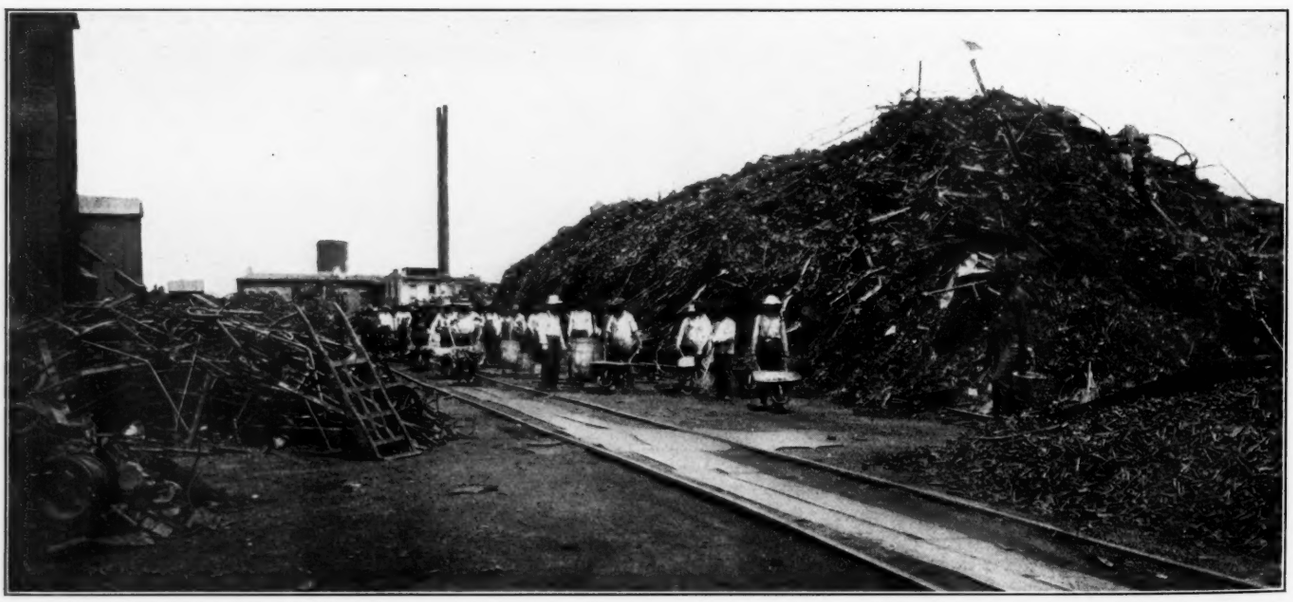


Fig. 11—Sorting the Scrap from the Accumulated Piles.

they are now re-tired at Corwith at a net saving of $1,619.47 for 361 wheels in addition to the saving in freight charges. The equipment for handling this work consists of four boring mills, three of which are shown in Fig. 15, one wheel lathe, one axle lathe, a 400-ton Niles-Bement-Pond wheel press, a turret lathe, two radial drills and one vertical drill. There is also an oil fire for shrinking on the tires.

As the re-tiring of all steel tired wheels is done at Corwith (except the driving wheels), it is made the distributing point for this class of wheels for the whole system. A complete system of monthly reports, signed by the mechanical and store department officials, showing wheels on hand and their condition so far as wear on tires, flanges, etc., is concerned, enables the foreman in charge at Corwith to handle the distribution to the best possible advantage; for instance, one division point may have wheels on hand with tires too thin for the class of locomotives running out of that point. Under ordinary conditions these wheels would find their way into the scrap pile, but owing to the above-mentioned reports, the wheels are forwarded to another division where lighter power is used and they are worn to their scrap limit.

The smith shop is provided with 15 forge fires, three small belt hammers, and a test rack for brake beams. This shop is called upon to do various jobs, the most important being the repairing of brake beams, the good parts of one being used to repair another, new heads and struts being applied where necessary. During the month of May 166 beams were thus reclaimed with a net saving of $257.09.

Other work done in the smith shop is the repairing of the material shown in the following table, in which is included the net saving made on that work during the month of May:

Material.	Number of Pieces.	Net Saving.
Picks	61	$15.68
Track drills	45	666.01

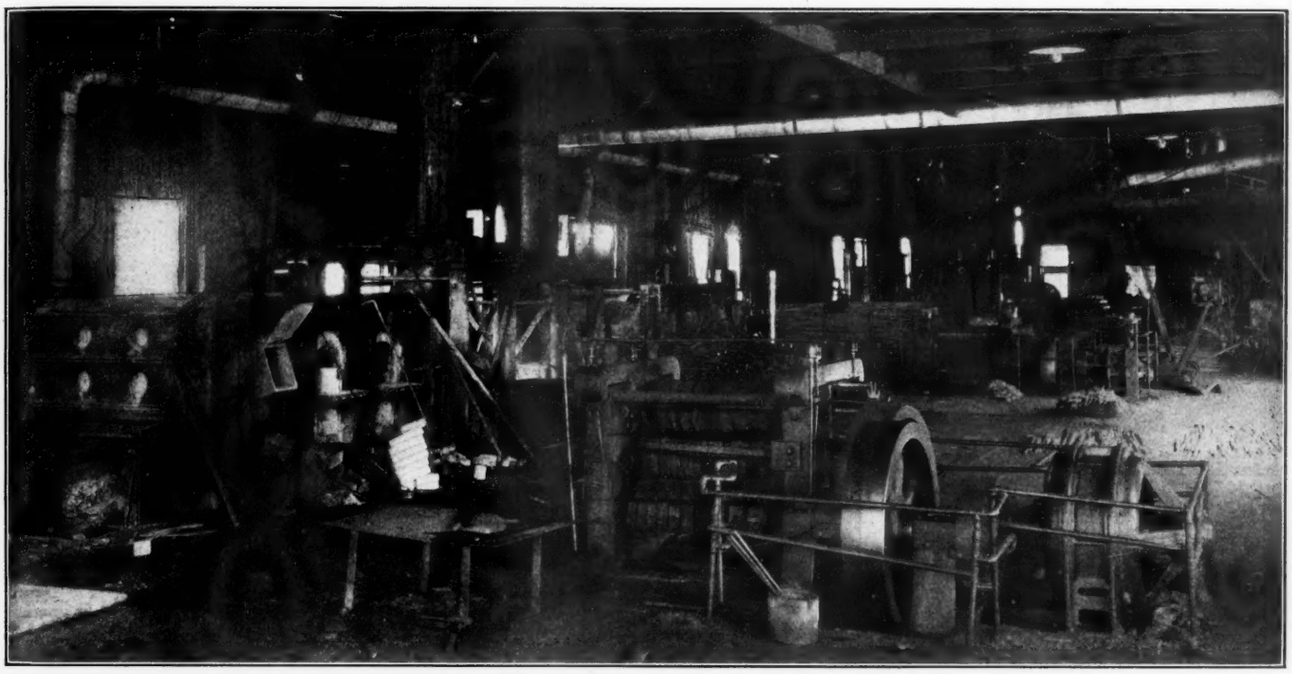


Fig. 13—Rolling Mills for Reclaiming Bar Iron.

Fig. 14—South End of the Bolt Shop in the Reclaiming Plant.

Material.	Number of Pieces.	Net Saving.
Jacks	170	903.83
Claw bars	95	79.71
Tamping picks	1,722	467.05
Switch stands	105	590.12
Jimmy bars	151	50.06
Knuckle locks	304	176.42
Switch chains	34	112.20

It will be noted that there is a considerable saving in the track drills, jacks and switch stands. These are mainly repaired by taking the good parts of one to replace the broken parts of another, which together with what straightening and forging there is to be done provides good serviceable switch stands.

The spikes are also straightened in the smith shop under a belt hammer whose anvil has one corner beveled off for sharpening the spike. This operation is performed after the spikes have been rattled. During the month of May 131 kegs were thus reclaimed at a net saving of $174.62.

The next building is the store house, a section of which is shown in Fig. 16. There is a room set aside in this building for the repairing of trucks, shovels and ballast forks. Two men are constantly busy on this work, and while the repairs are not extensive, considerable material is reclaimed, old handles taken from the broken blades being put in the shovels and forks. During last May 349 shovels were reclaimed at a net saving of $127.27; 43 ballast forks at $46.51, and a few trucks at $52.84. The latter item does not show as great a percentage of saving as the average.

The north end of the building is given over to the hose shop, where all couplings, nipples, clamps, etc., are removed from the scrapped hose, and the good ones are cleaned, painted and put into service again. In this way $259.89 was saved on air hose fittings and $408.46 on steam hose fittings in one month. This work is done at Corwith for the whole system by three men; formerly it was done at the division points. The cost of labor for the work has thus been materially decreased, and during the past two years it has not been necessary to purchase any nipples or couplings.

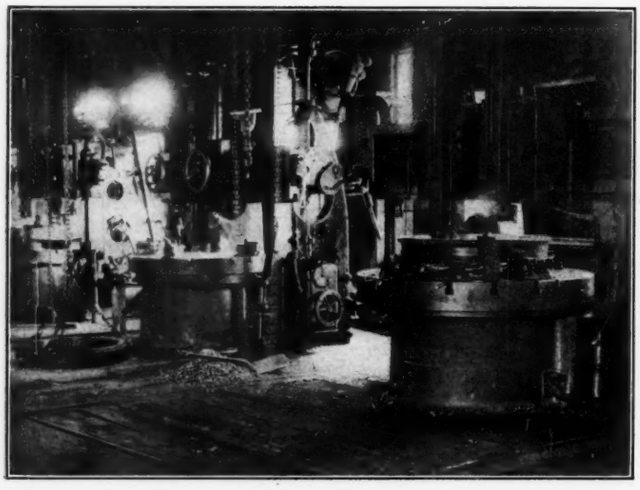


Fig. 15—Boring Mills in the Wheel Shop.

Fig. 16—Interior of the Storehouse for Reclaimed Material.

Fig. 17—Reclaiming Babbitt from Old Car Brasses at Corwith.

The brass shop is located to the east of the above-mentioned shops, and is used for melting the babbitt from car brasses, as shown in Fig. 17, and for the storage of the brass scrap and babbitt pigs. It is provided with a Dings electro-magnetic chip separator for separating the iron from the brass chips, a scale for weighing the amount of the brass and babbitt handled, four babbitt pots and a furnace for melting the babbitt from the journal brasses. The magnetic separator has been found very profitable. The babbitt pots are made from old locomotive domes and are fired with coal. Every piece of scrap iron containing brass finds its way to the brass house, where it is removed. The babbitt is melted from the car brasses at a cost of 36 cents per ton.

The shop adjoining the brass house is a valve shop where such valves as are not too badly worn or damaged are repaired. This includes triple and retaining valves, as well as the ordinary gate and globe valves. The shop is equipped with bench vices, an emery wheel, 18 in. lathe, a small horizontal miller, a 9-spindle valve grinding machine, a Westinghouse triple valve test rack, a 26 in. shaper, a Lucas horizontal boring mill, a small planer and a 12 in. lathe. The last four machines are used for other work than repairing the valves, the chief work of the shaper being broaching out car brasses that have not been sufficiently worn to require rebabbitting. When there is plenty of work this shop will repair on an average of five triple valves, 25 to 30 angle valves, and 30 to 40 other kinds of valves per day. The chief trouble with the globe and gate valves is broken stems.

The following list shows the material reclaimed in this shop during the month of May:

Kind of Valve.	Number.	Net Saving.
Globe	430	$46.72
Gate	44	57.16
Angle cocks	336	255.80
Cut-out cocks	191	79.45
Retaining	139	81.64
Triple (Westinghouse)	63	565.91
Triple (New York)	3	23.78
Broaching brasses	..	509.86
Boring brasses	..	225.54

The spring shop is just south of the valve shop and contains an air operated press to test the resiliency of the springs, a soft coal heating furnace, and an oil tempering bath. If the springs are found suitable for further use they are retempered; otherwise they are heated to a red heat and uncoiled, and are then sent to the smith shop to be made into claw bars, jimmy bars, etc. Springs valued at $449.23 were reclaimed in one month with a net saving of $195.92. This building also contains three rattlers and the boilers for heating the shops.

Of the castings reclaimed the small ones are cleaned in the rattler and the larger ones are dipped in paint. During last May the net saving from this one item was $3,242.83.

The work at Corwith is greatly hampered by labor conditions and the difficulty in holding men. All kinds of nationalities are represented there. The more intelligent of these are taught to sort scrap while the others are kept at the wheel barrow. Regardless of these conditions, however, the plant is well organized and with a few steady men retained as foremen the work is carried on successfully and is giving remarkable returns.

We are greatly indebted for the information regarding the handling of scrap on the Santa Fe to M. J. Collins, general purchasing agent, under whose personal direction the scrap plant has become such a paying investment; to N. M. Rice, general storekeeper, who is directly in charge of the accounts at Corwith, and to R. K. Graham, general foreman at Corwith, and his associates.

EARLY RAPID TRANSIT.—The Camden & Amboy Railroad is, we learn, partly completed and in use. This road will probably be the most traveled in this country. Passengers who leave Philadelphia at half-past six in the morning may dine in New York at 4 p. m., as they are landed at half-past three o'clock. The time is not far distant when six hours will be ample time to perform the journey.—*From the American Railroad Journal, October* 6, 1832.

TRESPASSERS KILLED AND INJURED ON THE NEW YORK CENTRAL.

To show graphically just how extensive are the injuries to trespassers on the New York Central & Hudson River, Frank V. Whiting, general claims attorney of the New York Central Lines, has had a graphical chart made as shown in the illustration. This diagram covers the calendar year 1912. On the original chart a circular tab or sticker, red in color, is used for each trespasser who has been injured, and a red "K" is pasted on the diagram for each trespasser that is killed. These are placed on the chart as soon as the accident is reported to the general claims attorney's office, and the diagram is therefore always up to date. The advantage of a chart of this kind is evident; at almost a glance it can be seen just where the accidents most frequently occur, so that special efforts may be made to improve conditions at those points.

The New York Central has given considerable effort to the prevention of accidents to trespassers, but the result has fallen far short of expectations because of the lack of co-operation on the part of the local authorities in the cities and towns along the road. In an article on "Trespassers Killed on Railways—Who Are They?" which was published in the *Railway Age Gazette* of March 8, 1912, Mr. Whiting showed conclusively that the problem is not so much one dealing with the tramp or hobo, but rather with those who in many instances are regularly employed, well-to-do and respected citizens, and that as far as prevention of accidents to trespassers is concerned the problem is really a local one, and wholly within the hands of the local officials.

That the magistrates have not co-operated with the railroad to as great an extent as is desirable is shown from the following data concerning the number of arrests during 1912 and the disposition of the cases:

CAR RIDING.

Penitentiary	472	Suspended sentence	2,976
Jail	1,072	Discharged	624
Reformatory	11	Turned over to outside police.	4
Humane Society	46		
Fined	201	Total	5,422
Probation	16		

TRESPASSING.

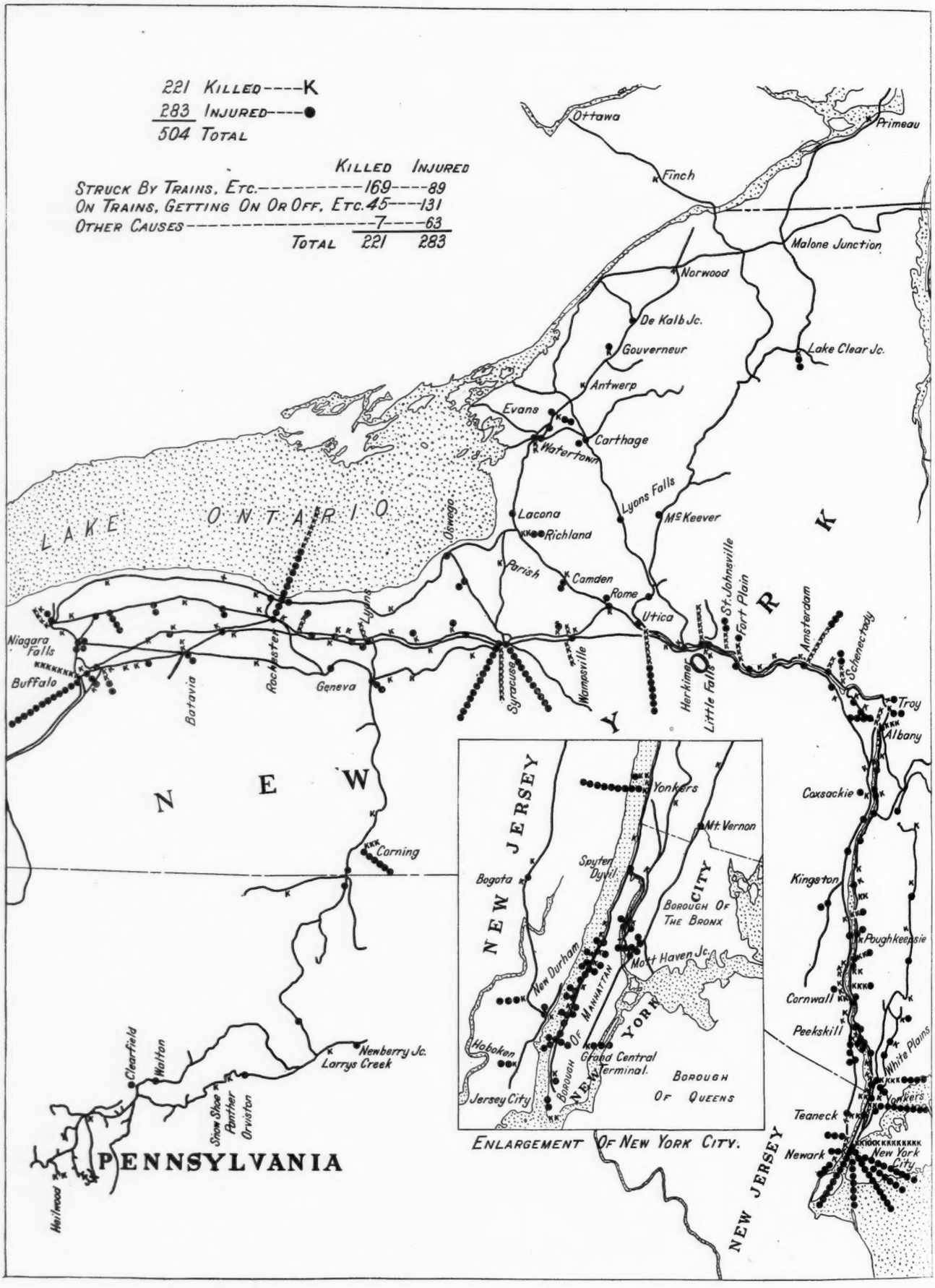
Penitentiary	70	Suspended sentence	585
Jail	146	Discharged	97
Reformatory	3	Probation	24
Fined	32		
Humane Society	8	Total	965

	Car riding.	Tres-passing.
Total number of days in sentences (penitentiary)	18,453	3,118
Total number of days in sentences (jail)	11,420	880
Total amount of fines paid	$966.00	$142.00

From the above it will be seen that less than 30 per cent. of the trespassers were punished for car riding, and only about 26 per cent. for trespassing. In about 67 per cent. of the cases the offenders were discharged or given a suspended sentence because the local communities did not care to incur the expense of sending the men to the jail or reformatory. When it is considered that the railroads are among the largest taxpayers in the communities through which they run, this hardly seems to be just. However thorough the railroad may be in policing its property there will be very little possibility of greatly reducing the evils of trespassing if the matter continues to be handled in this way.

The New York Central has tried to impress the local authorities with the necessity of dealing more severely with trespassers by sending to them Mr. Whiting's article on trespassing and similar information. This apparently has not been productive of results, and it is planned to have a member of the general claims attorney's staff visit the magistrates personally and try to impress upon them the necessity of greater co-operation. Meanwhile arrests of trespassers are being made at the rate of from 700 to 800 per month.

A determined crusade is being made to stop free riding on trains and to apprehend and punish car thieves. On the night



Showing Location of Accidents to Trespassers on the New York Central & Hudson River.

of July 29 practically all trains, passenger and freight, were stopped at S.S. 9, just west of Schenectady and a force of officers rounded up 46 men and had them sentenced as follows:

16 to penitentiary for 60 days each.
10 to jail for 30 days each.
7 to jail for 20 days each.
2 to jail for 15 days each.
3 to jail for 10 days each.
2 fined $5.00 each, which was paid.
4 fined $3.00 each, which was paid.
2 sentence suspended.

It is planned to repeat this treatment at other locations on the line.

A little over a year ago signs were placed on the telegraph poles warning trespassers, and reproducing part of the New York state law referring to that offence. While some of the local officers reported that these signs were being read and heeded, statistics for last year do not show that they effected any appreciable or permanent improvement. Believing that it would be wiser to post a briefer warning, measures are being taken to have the words "Do not walk upon the track" stenciled on telegraph and signal posts and other places where it will be seen and be liable to do the most good.

STEEL PASSENGER TRAIN EQUIPMENT.

The Special Committee on Relations of Railway Operation to Legislation has issued a bulletin on steel and steel underframe passenger equipment, from which the following is taken:

Four bills are pending in Congress requiring the replacement of wooden passenger equipment in steel. The periods suggested during which this is to be done vary from January 1, 1915, to January 1, 1918.

In order to ascertain the progress of the building of steel and steel underframe passenger equipment, and to develop the cost of reconstruction in steel of the present wooden passenger equipment in the country, Circular No. 40 was issued to the railways on January 10, 1913.

Replies to that circular have been received from 247 companies, operating 227,754 miles in the United States, and 57,493 passenger equipment vehicles, with 1,649 under construction on January 1, 1913.

Replies have also been received from eleven companies, operating 24,718 miles in Canada, and 4,891 passenger equipment vehicles, with 517 under construction on the same date.

Tabulations based on these replies are shown in the large table.

The estimates and percentages given hereafter apply only to the equipment operated by roads in the United States.

Attention is called to the following:

ACQUIRED.

	Total Number.	Percentages Steel. Per Cent.	Steel underframe. Per Cent.	Wood. Per Cent.
1909	1,880	26.0	22.6	51.4
1910	3,638	55.4	14.8	29.8
1911	3,756	59.0	20.3	20.7
1912	2,660	68.7	20.9	10.4
January, 1913 (under construction)	1,649	85.2	11.5	3.3

Between January 1, 1913, and July 1, 1913, orders have been placed by railways for 1,140 passenger equipment vehicles. Of these 1,064, or 93.3 per cent., are of all-steel construction, and 76, or 6.7 per cent., have steel underframes.

It will, therefore, be noted that the construction of wooden passenger equipment has practically ceased.

APPROXIMATELY IN SERVICE.

	Steel.	Steel underframe.
January 1, 1909	629	673
January 1, 1910	1,117	1,098
January 1, 1911	3,133	1,636
January 1, 1912	5,347	2,399
January 1, 1913	7,271	3,296
Increase 1913 over 1909	6,642	2,623
Increase 1913 over 1909	1,055 per cent.	389 per cent.

APPROXIMATE COST OF REPLACEMENT.

	Number.	Average Cost.	Amount.
Postal	680	$11,000	$7,480,000
Mail and baggage	2,724	10,000	27,240,000
Mail, baggage and passenger	679	10,000	6,790,000
Baggage and passenger	3,757	10,000	37,570,000
Baggage or express	7,431	8,500	63,163,500
Passenger	23,692	12,800	303,257,600
Parlor, sleeping, dining	6,864	22,000	151,008,000
Business	774	15,000	11,610,000
Motor	325	20,000	6,500,000
Total	46,926		$614,619,100
Annual interest charge at 5 per cent			$30,730,955

The charge to operating expenses under the classification of accounts of the Interstate Commerce Commission, assuming a value of $4,000 per vehicle replaced, will be $187,704,000.

TABULATION OF REPLIES FROM 248 RAILWAYS, SHOWING ACQUISITIONS OF STEEL PASSENGER EQUIPMENT.

Number of Passenger Equipment Cars Operated	In Service December 31, 1912				Under Construction or Contracted for but not yet Received on Dec. 31, 1912			Acquired in Calendar Year 1912				Acquired in Calendar Year 1911				Acquired in Calendar Year 1910				Acquired in Calendar Year 1909			
	Number Roads	Steel	Steel Underframe	Wood	Steel	Steel Underframe	Wood	Steel	Steel Underframe	Wood		Steel	Steel Underframe	Wood		Steel	Steel Underframe	Wood		Steel	Steel Underframe	Wood	
1 to 50	147	33	160	1,905	14	6	19	13	2	49		12	19	58		22	19	57		9	18	73	
51 to 100	23	103	136	1,203	16	18	6	5	28	1		28	32	9		80	22	44			7	7	
101 to 200	21	103	190	2,337	14	1		42	98	30		43	63	23		78	2	46		59	62	34	
201 to 500	23	391	380	6,259	281	6	1	103	43	17		235	113	43		174	102	118		15	35	119	
501 and upward	33	6,644	2,430	35,222	1,080	159	28	1,666	384	179		1,896	536	646		1,662	383	819		405	303	734	
Total U. S.	247	7,271	3,296	46,926	57,493	1,405	190	54	1,649	1,829	555	276	2,660	2,214	763	779	3,756	2,016	538	1,084	3,638	488	425	967	1,880
SECTIONS:																							
New England	9	32	121	5,468		115	8	20	16	22	103			14	422		24	193		10	6	114	
East	78	3,153	1,060	16,021		390	72	12	952	323	22		889	204	99		583	82	230		167	58	182	
Southeast	54	75	582	4,901		135	81	16	27	87	17		37	219	68		6	27	102			157	77	
Northwest	30	315	51	3,643		98	2		85	25	68		141		99		75	1	348		12		150	
Southwest	35	328	265	3,263		72	5	4	109	53	56		78	28	61		90	41	89		24	30	68	
West	40	2,039	1,032	8,982		318	22	1	357	33	10		550	298	30		743	363	68		269	174	108	
Sleeping Car Co's	1	1,329	185	4,648		276			283	12			519				519		54		6		268	
Total U. S.	247	7,271	3,296	46,926	57,493	1,405	190	54	1,649	1,829	555	276	2,660	2,214	763	779	3,756	2,016	538	1,084	3,638	488	425	967	1,880
Canada	11	1	14	4,876	4,891		71	446	517	1	6	533	540			231	231			178	178			121	121
Total U. S. and Canada	258	7,272	3,310	51,802	62,384	1,405	261	500	2,166	1,830	561	809	3,200	2,214	763	1,010	3,987	2,016	538	1,262	3,816	488	425	1,088	2,001
CLASSES OF EQUIPMENT:																									
Postal		570	209	680		128			30	10			286	88	11		140	10	11		52	30	5	
Mail and Baggage		274	275	2,724		137	13	1	123	56	8		95	47	36		43	34	70		17	17	65	
Mail, Baggage and Passenger		32	20	679		22	10	3	9	2	4		3	12	4		6	7	7			4	17	
Baggage and Passenger		281	144	3,757		63	16		123	32	18		45	29	42		110	16	64		12	22	62	
Baggage or Express		854	881	7,431		121	43	32	188	90	89		233	290	173		324	99	89		86	171	162	
Passenger		2,801	1,323	23,692		432	97	11	866	302	126		887	244	413		726	333	505		260	158	281	
Parlor, Sleeping and Dining		1,707	338	6,864		384	9	4	396	51	13		640	36	94		648	37	316		33	22	365	
Business		11	58	774		4	2	1	5	10	10		3	15	4		1	2	15		1	1	9	
Motor		741	38	325		114		2	99	2	8		22	2	2		18		7		27		1	
Total U. S.		7,271	3,296	46,926	57,493	1,405	190	54	1,649	1,829	555	276	2,660	2,214	763	779	3,756	2,016	538	1,084	3,638	488	425	967	1,880

LEGISLATION RELATING TO OPERATION.

[WITH AN INSET.]

The Special Committee on Relations of Railway Operation to Legislation has compiled a table, which is reproduced herewith, showing the classification of bills introduced and laws enacted relating to railway operation in the state legislatures which were in session in 1913. The table shows that in 42 states in which the legislatures were in session 1,395 bills relating to railway operation were introduced, of which 230 were enacted. In 1912, when 19 legislatures were in session, including six special sessions at which no such legislation was introduced, 292 bills of this character were introduced, of which 48 were enacted into laws.

As in previous years laws relating to employees and equipment were most numerous among those passed. There were 48 laws relating to employees, of which 14 are full crew laws, 10 relate to service letters and time of payment, 9 to terms of employment, 8 to hours of service and 5 to experience. The next most numerous class of laws passed were those relating to equipment and to stations, of which 33 each were passed. Of the equipment laws 14 relate to headlights, and were enacted in 13 states. Of the station laws 20 relate to station equipment and 7 to track connections. Thirty-two laws were enacted relating to crossings, 13 with reference to separation of grades. Under the head of maintenance of way 22 laws were passed, of which 9 relate to track scales and weighing, 5 to fencing and 5 to double track. There were 18 laws passed relating to passenger trains, 7 with reference to the equipment and 5 with reference to drinking on trains. Only 8 laws were passed relating to freight trains, of which 5 concern the speed of livestock trains. Laws regarding trespassing were passed in six states—Arizona, Kansas, Michigan, Pennsylvania, Rhode Island and Washington.

Indiana led in the number of bills introduced, with 99, of which only 18 were passed. Minnesota led in the number of laws passed, 19 having been enacted out of the 58 which were introduced. In Wisconsin 80 bills were introduced and 17 enacted.

REPORT ON BUTTING COLLISION AT BRANT, MO.

The Interstate Commerce Commission has issued a report, dated July 11, by Chief Inspector Belnap, on a butting collision of passenger trains which occurred on the Missouri Pacific at Brant, Mo., May 27, in which three employees and one mail clerk were killed and 48 persons were injured. The collision occurred at 3:49 a. m., and was due to a mistake by the train despatcher in sending meeting orders, and to a station operator's fault in manual block signaling. The order sent to the eastbound train, No. 12, contained four meetings, while that sent to the westbound train, No. 11, contained only two. According to the report, this order was numbered 4 in both cases; and yet the meeting point for these two trains was given as McGirk's in one order and Tipton in the other. The order as received by No. 12 read as follows:

> No. 3 Eng. 6409 meet No. 10 Eng. 5524 at Clarksburg and No. 12 Eng. 6415 at Tipton. No. 10 take siding No. 11 Eng. 112 meet No. 10 Eng. 5524 at Centretown & No. 12 Eng. 6415 at McGirk's.

As received by No. 11 it read,

> No. 11 Eng. 112 meet No. 10 Eng. 5524 at Centretown and No. 12 Eng. 6415 at Tipton.

Tipton is 18 miles west of McGirk's and train No. 11 passed McGirk's, and the collision occurred two miles west of there. Both trains were running at about 40 miles an hour. The first car in No. 12 was a steel mail car; this was crushed for about half its length. The first car in the other train was a wooden passenger car, empty, and this was wrecked and subsequently burned. Except for these two cars, no car in either train was knocked off the track. All of the cars in train No. 11 and four of those in No. 12 were returned to service by the same day.

The operator at McGirk's had authorized California, the next block station to the west, to send train No. 12 east; and then, about ten minutes afterward, admitted westbound train No. 11 to the same block, forgetting that he had pledged the block for the use of train No. 12. The report tells of conversations over the telephone as to where these trains were to meet, but no light is thrown on the cause of the operator's error. The testimony seems to be conflicting and the investigator offers no conclusion as to the explanation of the conflict.

The despatcher had had fifteen years' experience as operator and despatcher, and had a clear record on the Missouri Pacific since June, 1912. "His general condition and appearance, discrepancies on the train sheet on the day of the accident, and his total collapse after making a brief statement at the hearing, indicated that he was not in physical condition for the proper performance of his duties." As to what was the trouble with his physical condition the report gives no inkling. The operator at McGirk's had been employed nine years on many different railroads and had been discharged by the Chicago, Burlington & Quincy for using intoxicants. His record on the Missouri Pacific was clear. Whether or not these statements about the condition of the men are intended as hints that perhaps intoxicating liquor had something to do with this collision, does not appear. The report says nothing further on this point, but goes on to observe that as long as the human element is involved, errors will be made which will result in accidents; and that it is believed that the automatic block system is safer because it eliminates the human element in a greater degree.

The report says that Despatcher Roach failed to obey a rule requiring him to send train orders simultaneously, but it has nothing to say about the repetition of the order. The despatcher thinks he must have read, when sending to No. 11, that part of the order which refers to the meeting of No. 12 and No. 3.

TRAIN OF 99 CARS HAULED 111 MILES BY ONE LOCOMOTIVE.

On July 11 last the Rock Island road hauled from Dalhart, Tex., to Liberal, Kan., a distance of 111.2 miles, a train consisting of 98 loaded cars and caboose, of which 95 cars were loaded with cantaloupes and three with red ball freight, in five hours with a single Mikado locomotive. The run was made for the purpose of testing the capacity of the company's new Mikados, of which 75 have been acquired in the last 15 months; and for the purpose of the test three trains arriving at Dalhart from Brawley, Cal., were consolidated into one. The line over which the run was made is on a generally descending grade for the entire distance, Dalhart being 3,987 ft. above the sea level, and Liberal 2,853 ft. The maximum grade against the train eastbound was .8 per cent. This hill, at Beaver River, had to be doubled, making a delay of 38 minutes. The average time for the run was 22.2 miles per hour, and the actual running time, excluding several stops, was 4 hrs. 4 min., making an average speed of 27.3 miles per hour while running. The regular schedule of the California gold ball train, the fastest freight train on the system, is 6 hrs. 10 min. for this run.

Locomotive No. 2,504, which hauled the train, has a tractive effort of 57,000 lbs., and the weight on drivers is 240,000 lbs., while the total weight of the engine is 320,000 lbs. The weight of the train was 3,770 tons, and its length 4,430 ft. The cantaloupes were packed in 30,805 crates, making a total of 1,277,060 melons, or a number equal to one for every person in the state of Kansas. The run was made with seven tons of coal. There were three brakemen in the crew.

BILLS INTRODUCED AND LAWS ENACTED IN STATE LEGISLATURES, RELATING TO RAILWAY OPERATION

SUBJECTS	Ariz.		Ark.		Cal.		Colo.		Conn.		Del.		Fla.		Ga.		Idaho		Ill.		Ind.		Iowa		Kas.		Me.		Mass.		Mich.		Minn.		Mo.		Mont.		Neb.		Nev.		N. H.		N. J.		N. M.		N. Y.		N. C.		N. D.		Ohio		OKL.	
	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted	Introduced	Enacted
1. EMPLOYES																																																				
a. Full crews			4	1	1	1	6		1	1	1		3		1				6		3	1	3		6	1			1		6		3		5	1	4		8	1	1	1	2		4	1	1		3	1	3		2		3	1		
b. Hours of service	1	1	1		8	1	4		1				1						6		7		1		3				4		1		2		2	1	1		2		2	1							7	2					3	1		
c. Service Letters and time of payment	1	1	1		5		1		2		1		3						11	1	6	1	1		6		1	1	1		7	1	3		2	1	2		3		1	1	1		1		4		1		1				3	1		
d. Terms of employment	1	1	1	1	14	2	3		1				2						10						1		1	1	9	1	1				5		2		2		4		5	2	1		3		2				3	1		
e. Uniforms															1																									1	1			1				2							
f. Experience of			1		6		1		1				1						1		4	3			2	1	2		1						3				1				1				5		1		1		1			
g. Shelter for					1																1				1										1		1											2	1	1				
2. ARBITRATION																																																				
a. Compulsory							1																												1												4							
b. Voluntary	1	1													1						1	1	2	1					5								1	1			1	1												
3. TRAIN RULES																																																				
a. Uniform																			1		1				2																													
b. Flagging																			1						2	1											1																
4. EQUIPMENT																																																			
a. Caboose																			1		2				1		2	1			1						1	1			1	1							1	1				
b. Boiler Inspection	1																												1						2	1											2					
c. Headlights					1	1	2	1					1	1	2				3	1			4	2							2	1	2	1	4	1			2	1	1	1			1						1	1	2		
d. Safety Appliances																					1						1				1				3																3	1		
e. Repair of			1		2																																															
f. Appliances required					1		1						2								1	1	1	1	1		2	1	6				1	1			3				1	1	4				1		1					
g. Examination of																			1	1													2								1										2	1		
h. Specifications																			1		3	1	1	1	2								3	1																		
5 PASSENGER TRAINS																																																			
a. To be run																					1		1	1	3						1						1								1							
b. Stops			1																2		2		2		2						1		3				1								1				2			
c. Equipment of			2	1	7		2		1		2		4		1				5		5		5		2		2	1	1		2				4		1		4				2		1	1	4		1	1	3	1		
d. Baggage																															1				4						1											
e. Drinking on															1				1		2	1					1	2			1	1	3	1			1						1											
f. Ejection from							2	1																													2															
g. Make-up of																					1	1															3												1			
6. FREIGHT TRAINS																																																			
a. Speed of Live Stock																					1	1	1	1	2						2		2	1	3	1			2						1							
b. Sunday Trains															2																																					
c Speed of Dead Freight							1																		1		1								3	1											2						
d. Handling of Explosives							1								1								1																								1	1					
e. Make-up of			1																3		13		1		4												1															
7. CARS																																																			
a. To be Furnished													3								1	1			1	1					1		3				1		1				1				1				1	2		
b. Demurrage							1												1		5		1		2						2				3	1									1							
8. BLOCK AND OTHER SIGNALS																																																			
a. Block and Interlock							2																								1				1								1							
b. Switch Lights					1		1						1						1						1	1					1						2	1	1												1		
c. Automatic Stops									1																																											
9. CLEARANCES																																																			
a. Required			1		1						1				2						2												2	2			2												1	1		
10. CROSSINGS																																																			
a. Required	1		1	1					2				1				1		2		2	1	6								1	1	3		2	2	5	1											1			
b. Protection			3	1					1				1		2				5	1			3								2	1	1				5	1	1		2	1			1		4				1			
c. Separation of Grades			2												2				6	2	2	1	1	1	4	1	1				3	1	1	1			1			1	3	1			2				4	1		
11. MAINTENANCE OF WAY—GENERAL																																																			
a. Track Scales and Weighing						1													5		1		1		7	1					7	3	1	1	1		2						2							
b. Burning Weeds							1																1	1	3	1									2						1		1	1							
c. Fencing	1		1	1	2		2						4		1				1				1		1						2						1												1	1		
d. Drainage			1																		2		2		1						1		1																		
e. Inspection	1				2																3		2	1			1	1			1		1	1	1								1	1						
f. Double Track																																																			
12. STATIONS																																																			
a. Required															1										2								1	1	1	2	1						1		1						1	
b. Equipment of						4			1	1	2		2						1		5	2	2	2	1	1	1				2	2	5	1	1	1	1	1	3	2	1				1		3		4		3	2		5	
c. Stock Yards																									1														1														
d. Shop Equipment																			1	1	5										1														1	1				
e. Track Connections			1						1												1	1			1	2					1		8	2	1	1		1											1	
13. HOSPITALS AND RELIEF DEPT'S																																																		
a.			1		3		1																																											3	
14. CLAIMS																																																			
a. When to be paid							1						1		1				2		2		2		1	1					1										1		1		2		1				2	
b. Diversions and Confiscations																																																1				
15. TRESPASSERS																																																			
a.	2	1			1		3		1				3				2		5		1		3		5	1	1				1	1	3		2		1		4				1		1				1		2		2			
16. REPORTS																																																			
a. Accidents			2				2		2												2		1								1		2	1							1	1					1					
b. Delays																																																			
17. MISCELLANEOUS			1		3		4						1		5				1		1		3		1	1	5				2	1			1	1	1			1			3		2		2					
TOTAL	10	5	27	6	64	5	43	2	16	1	6		34	1	26		3		70	4	99	18	45	15	82	11	21	10	35	1	41	6	58	19	61	12	32	6	61	9	15	6	19	7	17	2	19		55	8	24	3	18	7	34	10	31	1

INTRODUCED AND LAWS ENACTED IN STATE LEGISLATURES, RELATING TO RAILWAY OP

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Y OPERATION, IN SESSIONS OF 1913.

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ARE AMERICAN RAILROADS OVERCAPITALIZED?*

Comparison With Conditions in Europe—Intrinsic Worth of American Properties—Need of Money for Improvements.

By Alba B. Johnson,
President of the Baldwin Locomotive Works.

Next to agriculture, transportation constitutes the largest industry of the country. Therefore the prosperity of the country depends, after abundant crops, upon the prosperity of the railroads. After the Civil War the country set about developing its great unsettled western country. For this development first railroads and then population were necessary. So great was the need for the first that extraordinary inducements were held out to capitalists to invest in railroad construction. These inducements were offered by the National Government, by states, by counties and by individual cities and towns. Rates of interest were high and the details of capitalization were scrutinized only by the investor, for at that time there was no public authority having jurisdiction over such matters. At that time the public at large was glad to have railroads on any terms. Now, however, a careful review is being made by economists and Government bureaus, of these details of railroad finance, to determine their effect upon present-day problems.

If those who believe American railways are seriously overcapitalized would study thoroughly certain facts, it is probable that most of them would conclude that they have attached too much importance to capitalization and would feel readier to co-operate for invigoration of railway credit through reinforcing railway revenue. The certainty of increased earnings for the railroads would do more for a restoration of national prosperity than any other factor conceivable. To start the roads into robust enlargement of facilities would feed many mouths, bless many regions, do much to steady business, postpone and minimize depressions and carry forward the widening of every man's selling area. This beneficent result is obstructed by the general delusion as to capitalization.

While President Brown, of the New York Central, was before the Interstate Commerce Commission in 1910, testifying for higher freight rates, an attorney of the shippers, Mr. James, was about to ask the witness his opinion of a statement in a book when Mr. Brown inquired, "What is that book?" Mr. James replied that it was Chapters of Erie, by Charles Francis Adams, written in 1871, the statements referred to being the passage on stock watering. Chairman (since judge) Knapp leaned forward and remarked in surprise:

"Do you mean seriously to intimate that the New York Central is overcapitalized?"

Sundry railway counsel, not appreciating the obstinacy with which the Adams fiber refuses to wither, and not knowing that this identical Adams, grandson of the sixth president and great grandson of the second, was at that moment in the prime of maturity at seventy-five, and capable of accepting summons and holding his own with any generation of interrogators whatever, jested on the point whether counsel would "produce Mr. Adams for cross examination," and whether he should be sought "above or below." So far back the lawyer had gone to find any competent authority to support his contention that the New York Central was overcapitalized.

The tradition of water securities is kept alive by a few classic instances. One earnest hydrophobe, who had heard that story about the New York Central, observed: "Please call Mr. Adams and ask him about ————," naming a railway company celebrated in recent times for stock jobbing.

Nothing is to be gained by issuing a clean bill of health to all roads since the discovery of the steam engine. If we are asked "Have American railway companies issued stock as a bonus with bonds?" the answer is "Yes; because it was then necessary to attract investors and was consistent with the business standards of the time; the practice was once general. Moreover in some consolidations securities were issued to a par value greater than that of the combined issues previously outstanding; also, directors have been known to operate construction companies and to issue stock to buy property from themselves."

Facts are facts, and converts are not to be won by denying them. Charles P. Neill, until recently Government mediator in railway labor disputes, says that whenever he found the employer indignant, with reason, and reluctant to arbitrate, he began the acquaintance by acknowledging that it was "an outrage." The belligerent was at once his friend, and inquired, "What do you advise me to do?" "Yield!" said the mediator, and compromise or arbitration followed. A frank admission of what has been done in the past with regard to capitalization, leaving judgment upon it to individual temperament and to Heaven, is the first step toward getting together and seeing what, if anything, should now be done about it.

If, then, as viewed by some, construction companies ought not to have been employed, or employed on other terms, and the stock bonuses ought not to have been given, and the consolidations should have been accomplished, if at all, without increase of capital obligations, how serious have been the results?

Receiverships have wiped out millions of the original capitalization. There were many receiverships and many drastic reorganizations of railroads prior to 1894, but during that year 210 railroads, or twenty per cent. of all the railroads in the United States, were in the hands of receivers and their reorganization was later effected by the wholesale scaling down of their original capitalization. There are no statistics available to show whether in the aggregate this was equivalent to squeezing out all the water originally contained; but many of the best-informed statisticians believe this to have been the case.

AN ILLUMINATING COMPARISON.

Earnings which could have been paid to stockholders, as is the custom in some other countries, have on American roads been put into the property without increase of capitalization. The old rule of the Pennsylvania Railroad Company was a dollar expended for improvements for each dollar disbursed in dividends to stockholders, and for years this practice was emulated by many of the most prosperous and conservative roads. In the twenty years, 1891-1910, the amount expended for terminal improvements and charged to income account aggregated no less than $459,839,061. The rigid accounting system of the Interstate Commerce Commission was not put into effect until the fiscal year 1908, and in the years before that large sums were expended on the property and charged to operating expenses which now are required to be assigned to capital account.

Stock again, instead of being given as a bonus "representing nothing but blue sky," has to a large amount been sold for cash above par. The economist, Floyd W. Mundy, cites three cases, the New York Central, Baltimore & Ohio, and Pennsylvania, which, in 1913, he estimates had a total capital stock of $934,242,088. Of this, $547,770,653 was issued since 1900, upon which the cash realized was $620,788,035. Three of our largest roads, he means, got an average of more than eight per cent.

*Reprinted from *The Saturday Evening Post.*

premium on at least sixty-one per cent. of their total stock now outstanding. Among other effects of this policy it has served in the case of these companies to wipe out, many times over, any increases of capitalization through unearned stock dividends.

As a result of these two sets of forces—the sins of the fathers and the penance of the sons—is the burden of interest and dividends sufficiently excessive to require a readjustment of that situation before the matter of reinforcing railway credit and reinvigorating railway progress is undertaken?

Let us seek an answer by sweeping away the cobwebs of par value and per mile of line, which may mean anything or nothing, and applying a test, perhaps rarely used, but a test fundamental, comprehensive and conclusive. Let us ask: Are payments to capital excessive? There happens to be one foreign country, Great Britain, which has a considerable railway system, privately owned and operated, and yielding statistics comparable with those for the United States. How does our burden of payments to stockholders and bondholders compare with the British? What share of the receipts goes into dividends and interest on funded debt? The figures are as follows:

RAILWAY RECEIPTS AND PAYMENTS TO CAPITAL.

United Kingdom, 1911.	
Receipts (returns to British Board of Trade, p. xix)	£127,199,570
Total capital (do., p. xxiv)	1,324,018,361
Average rate interest and dividends (do., p. xxvii)	3.59 per cent.
Amount of interest and dividends (computed from above)	£47,532,259
United States, 1910.	
Operating revenue (Interstate Commerce Commission Statistics of Railways, p. 70)	$2,750,667,435
Net revenue from outside operations (do., p. 70)	2,225,455
Total receipts	$2,752,892,890
Net interest (do., p. 69)	370,092,222
Net dividends (do., p. 69)	293,836,863
Interest and dividends	$663,929,085
Comparison.	
Interest and dividends percentage of receipts:	
United Kingdom	37.3
United States	24.1

If capital had received from American railways the British proportion of total receipts, 37.3 per cent., instead of 24.1 per cent., as was the fact, the American distribution of interest and dividends in 1910 would have been $364,772,072 more than it actually was.

Does this test of whether capitalization is or is not excessive afford an overwhelming motive for staying railroad progress in this country, while returns to owners and creditors of our roads are being scaled down?

To many, like the attorney above mentioned who wanted to call Mr. Adams and ask him about a specific road, averages for all the lines of each country compared may not be conclusive. To these, perhaps, one fact in the hand is worth two in the bush. Average statistics is the bush, and the particular instance known to him is the bird in the hand. How can we tell but that a considerable number of the principal American lines are carrying too heavy a burden of interest and dividend disbursements? Let us examine for his benefit an eastern and a western road which have been most criticized—Alton and Erie. What are the figures? Here they are:

NET DIVIDEND AND INTEREST PERCENTAGE OF RECEIPTS.

United Kingdom (1911)	37.3
United States (1910)	24.1
Alton (1910)	25.8
Erie (1910)	17.3

These figures do not excuse wrongdoing, if wrongdoing there has been, but on the other hand do they furnish reason for blocking American railway leadership as a whole in the development of American industry, commerce, agriculture and territory?

Par value of capitalization should be mentioned, lest the omission be misinterpreted. Par value affords no secure basis of comparison. The usual method is to assign capital per mile of line. This is faulty, because it leaves unanswered the question, What is a mile of line? A mile of line on an average in Texas has only 58.7 per cent. as many lines of track as has a mile of line in the statistical group situated in New York, New Jersey, Pennsylvania, Delaware and Maryland, only 23.2 per cent. as many locomotives and only 15.7 per cent. as many cars. So of terminal cost figures; the per-mile-of-line basis means little unless we know how many miles of line there are per terminal. If two roads have each two terminals, worth $1,000,000 apiece, and one is 1,000 miles long while the other is but 500, then the 1,000-mile line has capitalization charged to its two terminals of $2,000,000, or $2,000 per mile of line, while the 500-mile road has a capitalization charged to its two terminals of $2,000,000, or $4,000 per mile of line. Cost of road construction again may be as low as $20,000 a mile on the prairie and as high as $250,000 a mile through the mountains, or $1,000,000 a mile through the city. For this and other reasons comparison of capitalization is unsatisfactory. The facts, however, for what they are worth, are creditable to American railways by such a margin as fairly to raise the question whether any conceivable allowance for difference in conditions would offset it.

The Interstate Commerce Commission, by eliminating duplications, finds as the average net capitalization outstanding in the hands of the public a figure which is given in Statistics of Railways for 1910, page 52, as $62,657 per mile of line. This compares as follows with capitalization in the principal foreign countries, the reduction to terms of American money, in view of the amounts involved, being figured on the precise basis laid down by the United States Bureau of Standards—$4.8665 to the pound sterling, 19.3 cents to the franc, 23.8 cents to the mark—and reckoning 0.62137 mile to the kilometer:

CAPITALIZATION PER MILE OF LINE.

	Amount.	Excess Over U. S. (Per Cent.)
United States, 1910 (Interstate Commerce Commission Statistics of Railways, p. 52)	$62,657	
Germany, 1911 (Statistik der Im Betriebe Befindlichen Eisenbahnen Deutschlands, p. 13)	113,855	81.7
France, 1910 (Statistique des Chemins de Fer Français, pp. 334, 335)	144,683	130.9
United Kingdom, 1911 (Returns to British Board of Trade, p. xxiv)	275,156	339.1
England and Wales, 1911 (Returns to British Board of Trade, p. xxiv)	328,415	424.1

These figures, showing an excess over American capitalization ranging from 81.7 per cent. in Germany to 424.1 per cent. in England and Wales, are averages for all roads. "Net capitalization," on the basis used by the Interstate Commerce Commission for all the roads consolidated in one account, is not easy to compute for individual American roads, owing to the interweaving network of subsidiary corporations. To deduct from the total for the given road the securities of other roads held in its treasury still leaves a sum higher than the "net" actually is, because there would remain to be deducted the securities held in the treasury of every subsidiary, and so on in an all but endless chain. But consider the primary elimination, deducting from the total for the parent corporation only those securities of other companies directly held by it. This shows that there is no American road of considerable size which is not capitalized at less than the British average. Of American roads two hundred or more miles long, that having the highest gross capitalization per mile is the Erie. Its net figure, after making the partial deduction above defined, is $239,573. The United Kingdom shows an average for all lines 14.9 per cent. higher than the Erie; England and Wales 37.1 per cent. higher. The Alton net, thus figured, stands at $129,413. The French average for all roads shows 11.7 per cent. higher than the Alton; United Kingdom 112.6 per cent., England and Wales 153.7 per cent. higher than the Alton.

THE SHOE ON THE OTHER FOOT.

Suppose it were the railways of the United States instead of the European lines which showed excess of capitalization per mile of line 81.7, 130.9, 339.1, 424.1 per cent.; would not the country visit condemnation upon our roads in good round terms? It is not good form in the United States to applaud

railways. I would not suggest the indecorum of Americans throwing up hats over their impressive accomplishment in keeping down the capitalization charges on transportation; but may not one reasonably ask whether "overcapitalization," according to world standards, has really been so flagrant in the United States as to constitute a national emergency? To meet it, ought the replenishment of equipment and the building of terminals for the accommodation of freight to wait?

Is the question of capitalization, then, as related to actual investment, to be ignored and railway managers left foot-free? The problem is receiving assiduous attention. Railways operating five hundred miles or more of lines which pass through states having statutes for the regulation of railway securities aggregate 198,854 miles, which is 94.6 per cent. of the total in the five-hundred-mile class. The Interstate Commerce Commission is at this moment, under mandate of Congress, inquiring into railway capitalization.

Is capitalization, in view of these elaborate and concerted efforts to regulate it, a problem which absolutely must be solved as a condition precedent to revision of freight rates, stiffening of railway credit and provision for handling the expanding business of a great and growing country?

Even when instrumentalities for the regulation of security issues shall have been perfected, how certain is it that capitalization, or the return thereon, has very much to do with freight rates or can be made to have? The Baltimore & Ohio, the Pennsylvania, the Erie and the New York Central operate for the most part under a rate structure, the basis of which is the through rate between New York and Chicago, identical for all four. This rate was fixed by competition, but once established it has been accepted as a standard of reasonableness, and rates between points where there is no competition are automatically influenced by that rate through custom and through the long-and-short-haul clause of the Interstate Commerce Act. The whole population served by these roads is, therefore, paying for its transportation at what may be termed the same rates. Assuming that the valuation now under way shall provide a means of judging accurately the cost of the properties, what prospect is there that these roads will prove to be "worth" even approximately the same? One has enormously expensive terminals in Chicago and New York, another not; one passes through many large cities where land is valuable and where elevated, depressed, tunnel and other costly structures have been frequent, another less so; one had to be carried over or under mountains, another traverses mainly a level country. Measuring the actual cost of the roads to the public by the sure test of the percentage of receipts paid to owners and creditors we find that the New York Central distributed in 1910 in net interest on funded debt and in dividends 11.2 per cent. of receipts; Erie, 17.3 per cent.; Pennsylvania, 13 per cent., and Baltimore & Ohio, 23 per cent. What, in the light of these figures, can capitalization have to do with freight rates?

JUSTICE TO RAILROADS.

The Interstate Commerce Commission, as it observed in the Eastern trunk line rate advance case, handed down through Commissioner Prouty, "is called upon to deal with rates as they exist, and in so doing we ordinarily consider them, not from the revenue standpoint, but rather from the commercial and traffic standpoint." He went on to declare, discussing the Baltimore & Ohio, Pennsylvania and New York Central: "Under rates reasonable for these three systems there may be lines whose earnings will be extravagant, but that is their good fortune. There may be lines which cannot make sufficient earnings, but that is their misfortune." The need of the average road was adopted by the commission as the test. Anxious citizens, who come to see that poverty for their railway means a handicap to those it serves, may inquire what an average road is. They will at least want the door left open for making the rate level adequate for the particular road on which they depend.

Possibly we have been splitting hairs. A new railway question confronts us requiring statesmanship for its solution. When it becomes clear to enough people that the railroads have before them, in enlargement of facilities and provision for safety, a task which must be done, and which cannot be done with money now available, the Interstate Commerce Commission will have before it the demand that this work be accomplished and that conditions be made such that the roads can obtain the capital. No single adjustment for one territory or for one year will suffice. What is required is a permanent policy of protection to railway revenues.

It is to be hoped this may become a national policy. To this end business men may well study the question of capitalization for themselves. Should they perceive that it is largely irrelevant to freight rates let them frankly admit it, they and their representatives in the legislative councils of states and nation.

TRAVELING ENGINEERS' ASSOCIATION.

The twenty-first annual convention of the Traveling Engineers' Association was held at Chicago, August 12-15, President W. H. Corbett, master mechanic, Michigan Central, presiding. After the opening prayer by the Rt. Rev. Samuel Fallows, D.D., the convention was welcomed to the city by Leon Hornstein, assistant city attorney. W. A. Garrett, vice-president, Chicago Great Western, made an interesting and enlivening address praising the good work done by the road foremen of engines.

President Corbett, in his address, spoke of the importance of the road foremen of engines as regards the handling of trains. He mentioned the great benefits that had been derived by these men from attending the conventions of this association.

The secretary reported a membership of 957, which is a gain of 75 members over last year.

The report on the uniform instructions to engineers on the handling of superheater locomotives was presented at the first session by a committee, of which J. W. Hardy, Chicago, Rock Island & Pacific, is chairman. Besides many valuable instructions to the enginemen a brief outline of the purpose of the superheater was included.

Wednesday's session included a report on the credit due to the operating department for power utilization and train movement that reduces the consumption of fuel per ton mile, by a committee, of which N. J. Howley, Erie, is chairman. This report clearly pointed out the various means by which the operating department can assist in reducing fuel costs. W. J. Tollerton, general mechanical superintendent, Rock Island lines, also addressed the association at this session. W. C. Hayes, superintendent of locomotive operation of the Erie, outlined those features of the Master Mechanics' June convention which were of special interest to the traveling engineers. A committee report on the subject of the care of locomotive brake equipment on the line and at the terminals, also methods of locating and reporting defects, H. A. Flynn, Delaware & Hudson, chairman, was read and discussed.

On Thursday the convention was addressed by D. R. MacBain, superintendent motive power, Lake Shore & Michigan Southern, and H. C. Bayless, mechanical engineer, Minneapolis, St. Paul & Sault Ste. Marie. A paper was read by Le Grand Parish, on the advantages obtained with the brick arch in locomotive service.

The last session was addressed by W. B. Storey, vice-president, Atchison, Topeka & Santa Fe, and a paper was read by J. H. Lewis, chief smoke inspector of the Chicago, Burlington & Quincy, on "What We Can Do to Eliminate the Black Smoke Evil on Locomotives." The standing committee on the revision of progressive examinations for firemen for promotion and new men for employment also made a report. A detailed report of the convention, with abstracts of the papers and committee reports will be published in next week's issue.

DEPRECIATION OR VALUATION OF PROPERTIES.

By L. R. Pomeroy.

The precise meaning of the word depreciation, or rather the precise financial process by which it is to be covered, varies so much, both in theory and practice, that for the present purpose it will be advisable to consider provision against depreciation merely as the setting aside of a definite fund to cover the amount which must be written off each year to allow for the gradual deterioration of the plant.

The falling off in value of a manufacturing plant, which takes place over a course of years, is due to two causes, of which the first is the actual employment on the work for which it is intended, and the second is the adolescence which may take place, due entirely to external developments, with which the plant has no relation. The first of these is usually known as depreciation, while the second is sometimes termed antiquation. While purchase value is perhaps affected by age and wear, rental or going value, in absence of decreased efficiency, is not.

In 1908 James Edward Darbishue read a paper before the Institute of Mechanical Engineers (England), on the subject of "Depreciation of Workshop, Plant and Machinery." This paper aroused great interest and was fully discussed by prominent authorities. The curves shown in Fig. 1 are plotted from those

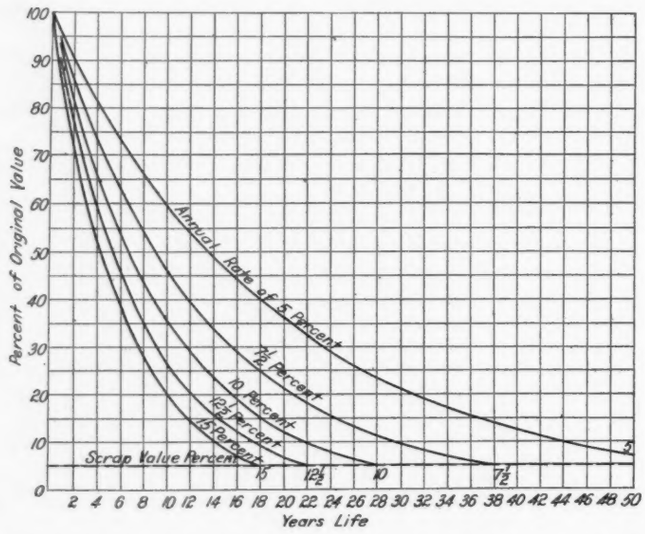


Fig. 1—Depreciation Curves Plotted from Those Presented by Mr. Darbishue.

presented in that paper and were the basis of the discussion. This form of depreciation is also used by Matheson, the celebrated English authority, in his book on the "Depreciation of Factories and Their Valuation."

The amount of depreciation shown by any rate, x, selected from these curves is a varying one, because it is not a constant rate for every year. It diminishes year by year, by x per cent. on the last or previous year's value. Assuming a rate of 10 per cent. it would take a period of 28 years for the amount to reach the scrap value (5 per cent. of the machine).

While it was admitted that a 10 per cent. rate was a fair one it was thought that the amount should be so adjusted as to be at a lesser rate for the early life of the machine and gradually increasing more rapidly during the latter life of the machine, the curve ending at the scrap value just as the regular curve for 10 per cent. does.

Fig. 2 is presented to show among other things, the comparison of curves based on these ideas. Curve *A* shows the regular 10 per cent. depreciation, while curve *"A modified"* represents the adjusted curve suggested. The modification is based on, or follows the curve on the diagram representing the assumed profit value of the machine.

A comparison of the various methods in use leads the writer to recommend and emphasize the curve shown in Fig. 2, plotted from the formula presented by Mr. McKay in the May issue of *Machinery,* for the reason that it takes into account the replace-

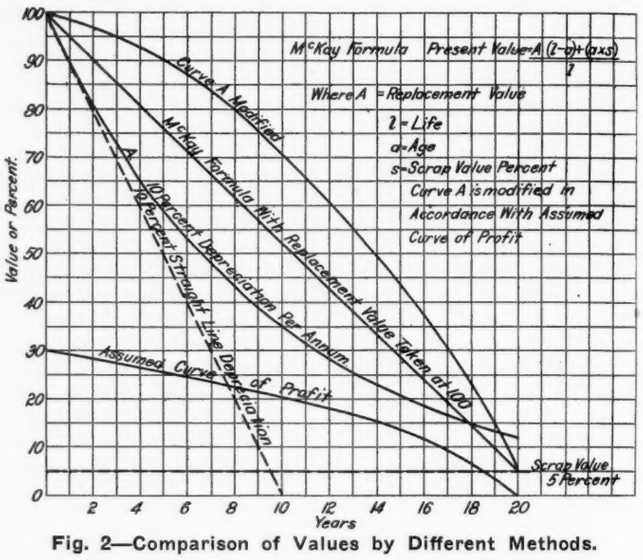

McKay Formula Present Value=A(1-a)+(axs)
l
Where A = Replacement Value
l = Life
a = Age
s = Scrap Value Percent
Curve A is modified in Accordance With Assumed Curve of Profit
Curve A Modified
McKay Formula With Replacement Value Taken at 100
A
10 Percent Depreciation Per Annum
Straight Line Depreciation
Assumed Curve of Profit
Scrap Value 5 Percent
Value or Percent
Years

Fig. 2—Comparison of Values by Different Methods.

ment value of the tool or machine, which in all fairness is a consideration to which the plant is intrinsically entitled. If another type of machine is selected to replace the old machine, the difference in cost of the new machine over the replacement value of the old machine may be properly considered a betterment and can be capitalized.

Following is an example or illustration of the value found by the various methods given on the basis of 20 years' life, showing the values at 5, 8, 10, 18 and 20 years:

10 Per Cent.			McKay Formula	
Straight Line Depreciation. Per Cent.	10 Per Cent. Curve A. Per Cent.	Curve A Modified. Per Cent.	Replacement Value 100 per cent. Per Cent.	Replacement Value 120 per cent. Per Cent.
		Five Years.		
50	59	90	76	91

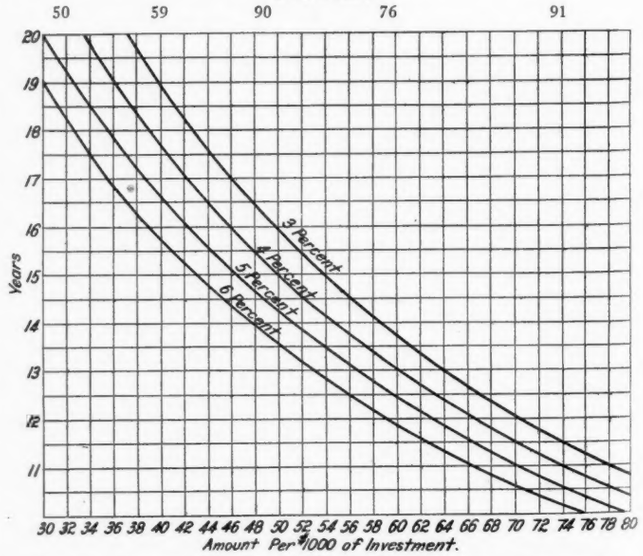


Fig. 3—Curves for Computing Sinking Fund Payments.

		Eight Years.		
20	43	80	62	74
		Ten Years.		
0	35	70	52	62
		Eighteen Years.		
0	15	23	15	18
		Twenty Years.		
0	12	5	5	6

The above bears more directly on valuations and appraisals or applies to the starting of an inventory as the basis of a systematic method of handling depreciation in connection with general accounting. It would seem, however, that the sinking fund method is preferable, as it provides an automatic plan of extinguishment of the initial investment, at a predetermined life, by furnishing a fund which, at the termination of this life, is equal in amount to the original investment and forms a replacement fund.

Fig. 3 gives curves for computing depreciation or sinking fund payments for interest compounded annually. These curves show: First, the annual payments per $1,000 invested to repay the original outlay at the end of a given number of years and, second, the term of amortization, i. e., years. When a given amount per $1,000 of principal or per cent. is paid into the sinking fund annually, the formula is as follows:

$$\text{Annual rate } x = \frac{R}{(1+R)^n - 1}$$

and for the number of years:

$$N = \frac{\log \dfrac{R+x}{x}}{\log (1+R)} \text{ where}$$

N = Number of years or term of amortization.
R = Rate of interest received.
x = Rate of depreciation charge or annual sinking fund installment in dollars per dollar.

For example, assume the life of a tool, machine or plant to be 20 years. Then the annual sum at 5 per cent. interest compounded, set aside each year to absorb the investment, equals $30 per $1,000 of principal or 3 per cent. For 15 years' life, $46.40 or 4.64 per cent.; or the amount and rate being given the term of years can be read directly from the curves. Suppose the amount to be 5 per cent. or ($50 per $1,000) compounded at 5 per cent. Then the number of years, from the diagram, that this given amount at 5 per cent. will absorb the original investment is 14.25 years.

NEW PASS FORM FOR ROCK ISLAND LINES.

The Rock Island Lines adopted on July 1 a new form of trip pass both for exchange purposes and for employees' use, designed by E. A. Fleming, chief clerk in the office of the president. The new form was adopted primarily on account of the saving of time and labor which it was believed it would afford in the issuance of passes in offices where large numbers are handled, and also for the purpose of more effectively preventing misuse by various methods which have been practiced to a considerable extent.

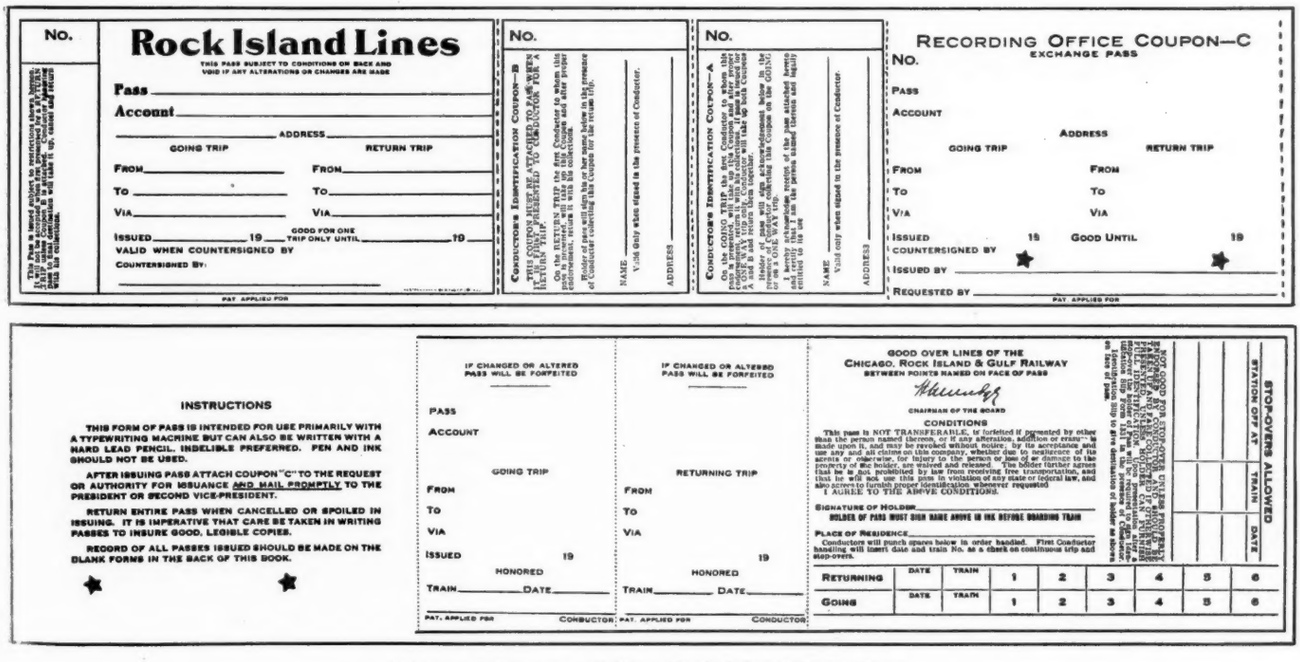
The illustration shows both the face and reverse sides of the pass form. It will be noted that there are three sections of approximately the same size, divided by perforations. The pass folds at these lines of perforation, and, by means of two pieces of carbon paper, the face of the pass, the reverse side of the central section, and the face of the recording coupon are written at one operation. The central section is further divided into two coupons that are to be used for comparative checking and identification purposes, and are to be taken up and returned by conductors when the pass is first presented for passage on both the going and return trips. These coupons, when the pass is written, will show on the reverse side that part of the trip, going or returning, that they represent.

The pass proper provides spaces for either one way or round trip, or two separate trips if preferred, as it is not essential that the return trip be between the same points as the going trip. Space is also provided for showing the residence address of the holder of the pass and via what route the trips are to be made. The recording coupon, after being written, should afterwards be endorsed in the proper space to show the name of the officer issued by and by whom requested. No year will be shown on the pass except as is required in writing it, thus making the pass good for use during any ninety day period. The prefix letters now used in numbering will also be done away with by reason of the fact that no two trip passes of any class will bear the same number. The new issue of passes will begin with No. 25,001 and run consecutively for several years. Only annual passes will bear numbers below 25,001.

The forms are supplied in sheets (of five passes each) padded together, and in single form bound 50 passes per book; the former to be provided where they can be used to advantage. Passes may be written either by typewriter or with indelible pencil. When they are furnished in books a blank form is inserted to be used by the issuing office for reference after the recording coupons have been turned in.

The pass proper is to be retained by the holder until the trip shown thereon is completed.

The new form has been approved by the Interstate Commerce



Face and Reverse of New Rock Island Pass Form.

Commission, and special authority has been granted to the Rock Island Lines for its adoption, with the request that advice be given as soon as may be possible of the results obtained in connection with its use.

It has now been in service for several weeks and has proved entirely satisfactory, not only saving time in the office, but causing no confusion in its handling by the conductors.

AROUND THE WORLD IN THIRTY-SIX DAYS.

John Henry Mears, a representative of the New York *Evening Sun,* arrived in New York City on the evening of August 6, after traveling around the globe in thirty-five days, twenty-one hours, thirty-five minutes and four-fifths of a second, or within less than one second of the time which was calculated before the journey was begun. Mr. Mears says that he averaged 587 miles a day, 24.5 miles an hour, and that the distance traveled was 21,066 miles. The shortest day's travel was 287 miles, from London to Paris; and the longest was 955 miles, on the last day of the journey, from Indiana Harbor to New York; and this occupied only 21 hours 18 minutes. He says that the most serious dangers he encountered were in Siberia, where an infuriated railroad officer [conductor] threatened him, and on Puget Sound, where he transferred from a steamer to a hydro-aeroplane.

The last stage of the railroad journey was by the Empire State Express from Buffalo to New York. This train was delayed near Albany, by reason of damage to track by heavy rain, but reached New York, on time, at 10:10 p. m. From the station at New York to the office of the *Sun,* about three miles, the trip was made in automobiles, in about five minutes, officers of the police department riding in another car ahead, to make sure of a clear road.

From the fragmentary accounts printed in the *Evening Sun* we gather the data given in the tables below. It will be seen that the distance from Chicago to New York is overstated by about 12 miles.

While the trip was completed in the time calculated, there were a number of serious delays, but these were made up by changing routes and by other devices. Mr. Mears says that railroad and steamship officers were uniformly accommodating, except in the case above noted. In the first stage of the journey, the voyage across the Atlantic, there was a delay of several hours by reason of fog. In Siberia there was a delay of 18 hours because of a washout. For several days after this Mears was liberal in his payments of money to the locomotive enginemen. Between Victoria, B. C., and Seattle there was a fog and before landing at Seattle he transferred to an aeroplane. At Cleveland, Ohio, the train was delayed just outside the station, and Mears traveled a short distance on foot to make his connection with the train east from Cleveland.

Original Itinerary.

Lv. *The Evening Sun* Office, July 2	12:45 a. m.
Ar. Cunard Line Piers, July 2	12:59 a. m.
Lv. New York by *Mauretania,* July 2	1:00 a. m.
Ar. London, July 7	1:00 a. m.
Lv. London, July 7	9:00 p. m.
Ar. Paris, July 8	5:50 a. m.
Lv. Paris, July 8	1:45 p. m.
Ar. Berlin, July 9	7:29 a. m.
Lv. Berlin, July 9	7:15 p. m.
Ar. Moscow, July 11	3:50 p. m.
Lv. Moscow, July 11	10:30 p. m.
Ar. St. Petersburg, July 12	9:15 a. m.
Lv. St. Petersburg, July 12	2:25 p. m.
Ar. Harbin, July 20	11:40 p. m.
Lv. Harbin, July 21	1:00 a. m.
Ar. Vladivostok, July 21	8:20 p. m.
Lv. Vladivostok by boat, July 21	9:30 p. m.
Ar. Tsuruga, July 23	3:30 p. m.
Lv. Tsuruga, July 23	7:40 p. m.
Ar. Yokohama, July 24	8:23 a. m.
Lv. Yokohama by *Empress of Russia,* July 24	4:00 p. m.
Ar. Victoria, Aug. 2	8:00 a. m.
Lv. Victoria, Aug. 2	8:30 a. m.
Ar. Seattle, Aug. 2	1:45 p. m.

Original Itinerary. (Continued.)

Lv. Seattle, Aug. 2	7:10 p. m.
Ar. St. Paul, Aug. 5	7:55 a. m.
Lv. St. Paul, Aug. 5	8:30 a. m.
Ar. Chicago, Aug. 5	9:00 p. m.
Lv. Chicago, Aug. 5	11:30 p. m.
Ar. Cleveland, Aug. 6	7:50 a. m.
Lv. Cleveland, Aug. 6	7:50 a. m.
Ar. Buffalo, Aug. 6	11:45 a. m.
Lv. Buffalo, Aug. 6	1:00 p. m.
Ar. New York, Aug. 6	10:10 p. m.
Ar. *The Evening Sun* Office, Aug. 6	10:20 p. m.

Total time—35 days 21 hrs. 35 min.

The itinerary was changed to cut out Moscow, Vladivostok and Tsuruga.

Distances.

	Miles.
New York to Ambrose Lightship	28
Ambrose Lightship to Daunt's Rock Lightship	3,397
Daunt's Rock Lightship to Fishguard	144
Fishguard to London	261
London to Paris	287
Paris to Berlin	672
Berlin to St. Petersburg	1,022
St. Petersburg to Irkutsk	3,492
Irkutsk to Harbin	1,533
Harbin to Chang Chun	152
Chang Chun to Mukden	189
Mukden to Antung	170
Antung to Fusan	583
Fusan to Shimonoseki	150
Shimonoseki to Tokio	704
Tokio to Yokohama	17
Yokohama to Victoria	4,871
Victoria to Seattle	100
Seattle to St. Paul	1,907
St. Paul to Chicago	411
Chicago to New York	976
Total	21,066

St. Petersburg was the point furthest north on the route, 60 deg. north latitude. Shimonoseki was the point furthest south, 34 deg. north latitude. The difference is 26 deg. It will be noted that layovers of considerable length were scheduled at a number of points, for example: London, 21 hours; Paris, 7 hours, 55 minutes; Berlin, 11 hours, 46 minutes, etc. If any one thought it worth while to engage special trains and steamships the circuit of the globe could be made, evidently in much less time than 35 days.

Names of Carriers.

Cunard line, from New York to Fishguard.
Great Western Railway, from Fishguard to London.
———, London to Calais.
Northern Railroad, from Calais to Paris.
Eastern Railroad, from Paris to Franco-German line.
Prussian State Railroad, from the international line to Berlin and thence to the Russian line.
Russian State Railroad, from the Russo-German State line to St. Petersburg, and thence to the Trans-Siberian, and the Trans-Siberian line to Harbin.
South Manchurian Railway, from Harbin to Mukden.
Chosen Railway, from Mukden to Fusan, Corea.
Imperial Japanese Railway (and steamer), from Fusan to Yokohama.
Canadian Pacific steamship *Empress of Russia,* from Yokohama to Victoria.
Seattle Yacht Club and Christopherson's hydro-aeroplane, from William Head and Race Rocks, Puget Sound, to Seattle.
Northern Pacific Railroad, from Seattle to St. Paul.
Chicago & North Western, from St. Paul to Chicago.
Lake Shore & Michigan Southern, from Chicago to Buffalo.
New York Central & Hudson River, from Buffalo to New York.

The *Evening Sun* prints the records of previous around-the-world journeys as follows:

Name.	Record— Years.	Days.	Hrs.	Min.	Sec.	Date.
Magellan Expedition	3	..	..	..	..	1519-1522
Capt. W. D. Seymour	..	117	..	..	..	1876
Nellie Bly	..	72	6	11	14	1889
George Francis Train	..	67	12	3	..	1890
Charles Fitzmorris	..	60	13	29	42⅖	1901
Henry Frederick	..	54	7	20	..	1903
Col. Burnley Campbell	..	40	19	30	..	1907
Andre Jaeger-Schmidt	..	39	19	42	37⅘	1911
John Henry Mears	..	35	21	35	⅘	1913

The journey of Col. Campbell was the first made over the Siberian Railroad. Mears, it will be noted, crossed the Pacific ocean in nine days, a much quicker voyage than was possible prior to the advent this year of the new and fast steamers of the Canadian Pacific Railway.

Maintenance of Way Section.

THE statistics of bills introduced and laws enacted in state legislatures during 1913, published elsewhere in this issue, show that maintenance is a subject not entirely overlooked in the present crusade of legislative regulation. The measures directly affecting the maintenance department are classified in the tabulated statistics under four heads: clearances, crossings, maintenance of way—general, and stations. In the 42 state legislatures which met in 1913, 362 bills were introduced under these four heads, of which 90 became laws. The equipment of stations apparently concerns the legislators more than any other item in these groups, for 70 bills were introduced and 20 laws passed on this subject. Forty-three bills were introduced and 13 laws passed governing the separation of grades at railway crossings and three laws were enacted specifying clearances as a result of the introduction of 13 bills. The state of Minnesota holds the individual record in legislative activity from the standpoint of the maintenance department with 32 bills introduced and 13 passed. Indiana is a close second, however, with 32 introduced and six passed. Only 14 legislatures met in 1912, so that a direct comparison with the showing made last year is difficult, but the fact that only 50 bills were introduced and five laws passed in 1912 under the four heads mentioned, shows that the average record per state for 1913 is more than double that of last year.

WE venture to prophesy that in point of attendance, quality of reports and discussion and size and value of the exhibit, the 1913 convention of the Roadmasters' and Maintenance of Way Association to be held in Chicago, September 9-13, will be fully up to past performance, if it does not establish some records. Now as to the facts which justify such a prophesy. The association gained nearly 25 per cent. in membership last year by adding 125 members. In spite of this phenomenal record, the increase so far this year shows that the numerical growth by the time the convention meets will be even greater than last year. A large membership means a large attendance, provided the meetings are interesting and are held at a point convenient to a large percentage of the members. The work of the officers and committees assures an interesting program. Following the precedent established last year of cutting down the number of subjects, only five reports will be presented and good live discussions should be brought out on each subject. Chicago is one of the easiest cities in the country to reach, and a large percentage of the membership of the association is on roads which terminate in Chicago. As to the exhibit, it is enough to say that 50 firms have already reserved space as compared with 39 at Buffalo last year.

COMPARATIVELY few roads have facilities for carrying on tests of track devices and forms of construction in a systematic manner. The suggestion made by Mr. Milner, in his article in this issue, that the railways co-operate in establishing and maintaining an experimental track, has some sound arguments in its favor. In studying the stresses in track, which would be one of the first problems to be considered at such a testing plant, some reliable and valuable data should be secured. Very few engineers would be willing to assert that our present standard construction is the only one which has merit, although practically all efforts to increase the strength of track to take care of increased loads have been made along the line of strengthening the individual elements of the existing track, rather than in starting with basic principles and designing a structure to meet the requirements. Thorough tests of other types of construction might well repay the effort. Such a testing station could also handle all tests of track, switch and signal devices much more advantageously than the individual roads. The value of many devices is dependent largely on the conditions under which they are used, and if tests can be made where there are facilities for varying all the conditions affecting a device, as would be the case at such an experimental station, the true merit of the device may be determined. The length of time required to secure results in an ordinary service test is too great in most cases to make the test practicable. A special test track can be subjected to much more frequent train movements, thereby decreasing the required time very materially. In order to place any confidence in experimental data, the observations must be made by men who are qualified and trained to handle such work. The average service test can at best be inspected only at intervals by the chief engineer or other responsible officer, and the success or failure of the device may depend entirely too much upon the individual preference of the roadmaster or foreman in charge of the section on which the device is installed. A testing station could be put in charge of a well qualified man, possibly at one of the large engineering schools, as suggested by Mr. Milner. The German station mentioned in the article has found it necessary to withhold all data referring to the relative merits of devices from publication on account of the controversies that are started by manufacturers when their devices do not show up well and the unduly colored advertisements which may be used by the owners of favored devices. It might not be as easy to handle this phase of the matter in a station maintained by the co-operation of a number of roads as it is at the German station maintained by the government. It is difficult to anticipate the attitude of manufacturers toward such a comprehensive system of tests, but the firms that have devices of merit certainly would have nothing to fear, and others would deserve the disfavor which such tests would bring upon them. The cost of building and maintaining such a station would be excessive for any one road, but it ought to be small enough to make it an excellent investment if it could be entered into by a number of roads, preferably through such an association as the American Railway Engineering Association.

CHEAPER FUEL FOR PUMPING ENGINES.

THE increase in the cost of gasolene during the last two or three years has increased the cost of operating many gasolene pumping plants at water stations practically to the level of steam plants. It is a difficult matter to give average figures for the cost of gasolene, either at present or in past years, from which to determine the exact amount of the increase that has taken place. The price which railways pay is fixed largely by local conditions, the competition of small independent companies keeping the price relatively low in some instances. The price paid is fixed by contract covering very large quantities of this fuel so that the cost to small users is not an index of that to the railways. In some instances the price paid for gasolene used at certain pumping stations is even less now than it was three years ago, for instance, but in the great majority of cases the present prices show increases, some of which are as much as seven cents per gallon, or even more. The average increase is variously estimated at from 25 to 40 per cent.

The gasolene engine has proved its value in the water service department, especially for small installation, and a large number of plants of this type have been successfully operated. The general use of these engines makes the increase in the price of gasolene very important to water service men. If the price con-

tinues to increase—and on account of the limitations of the supply and the phenomenal increase in the use of the automobile, the indications are that it will—either present engines will have to be replaced by steam or electric plants or some other fuel will have to be found which can be economically used in the internal combustion engine. Since the latter alternative involves a much smaller outlay for new equipment than would be necessary to install steam or electric plants, it is very much to be favored and both manufacturers and water service men are giving their best efforts to the development of oil engines and attachments which will allow crude oil, kerosene, motor spirits, or some other cheaper form of fuel to be used in the gasolene engines which the roads already own. The advances that are being made in the use of oil engines for pumping water are well described in Mr. Knowles' paper elsewhere in this issue. It would seem from the figures presented by him that a fair start has been made toward the satisfactory solution of the problem.

The necessity for securing cheaper fuel for internal combustion engines is being discussed by users of gasolene motors throughout the world. One of the most thorough investigations of future supplies of hydro-carbon motor fuels and of substitutes for hydro-carbons, was presented in two papers before the Imperial Motor Transport Conference at a recent meeting in London. These papers define motor spirits, one of the fuels used in Mr. Knowles' experiments, as any easily evaporated combustible liquid sufficiently volatile to form an explosive mixture with air at a moderate temperature. This would include a great many oils among which are a number of the distillates of petroleum. By a process called "cracking," which heats hydro-carbons until they split into lighter carbon and hydrogen or into other hydro-carbons, many oils which would otherwise not be suitable for fuel can be utilized.

Other motor spirits which have already been utilized to some extent are obtained from shale oil and bituminous and cannel coal. Certain coal tar oils may be made available for use as motor fuel by processes of cracking, the commercial availability depending, as in most of the other substitutes that are being suggested, on the ability to market the by-products which are obtained in their production.

One of the papers referred to recommended the use of alcohol very strongly. While Mr. Knowles' tests, published in this issue, show that alcohol is not economical for oil engine fuel, he indicates, in commenting on the tests, that the engine used was not adapted to alcohol. The author of one of the English papers maintains that motors can be properly designed to burn alcohol at a very low cost. It seems certain, however, on account of the present price of alcohol, the lack of suitable alcohol motors and certain corrosion troubles which are experienced in its use, that for the immediate future at least, relief will be sought in some of the power distillates.

RECLAIMING MAINTENANCE SCRAP.

A FEW roads which are paying special attention to the utilization of second-hand and scrap material are effecting material economies. Most roads have adopted some system of collecting scrap at frequent intervals and section gangs are required to assemble it at central points on their sections, to be picked up by the train making such collections. However, this practice is by no means universal, and there are still some roads that make no organized effort to prevent the loss of this material. A recent inspection of a yard on an eastern road revealed large quantities of bolts, spikes, tie plates, as well as couplers, brake beams and other car parts scattered about between the tracks. If this condition is typical of the entire road, many thousand dollars are being needlessly wasted, as the value of this material would repay the cost of its collection several times over.

The relaying of rail has been practiced almost universally, and a second use of track fastenings is usually obtained, but there are still opportunities for improvement in the handling of such material to get the greatest value from it. We have called attention more than once to the operation of rail sawing plants and rail inspection and classification yards, and elsewhere in this issue is published an article on the collection and handling of second-hand rail on branch lines, which includes some excellent suggestions.

The reclaiming of maintenance scrap, other than rails and angle bars, has not been generally attempted, and in fact the reclaiming of small scrap in other departments has been largely a local matter at division points or terminals. A number of roads, however, are establishing scrap depots and reclaiming shops to handle the scrap collected from the entire road, and the results of the operation of these shops show that large economies can be effected by such a method. In a great many cases, track material and tools are discarded and get into the scrap pile, which are not usable in the condition in which they are found, but which would not require extensive repairs to make them as good as new. The Lackawanna, for instance, finds that over 50 per cent. of all material other than rails and angle bars which is sent in as scrap can be put back into service after making some slight repairs, thus increasing its value from that of scrap to new material. The Southern Pacific has for some time been making tie plates, angle bars, spikes and other track fastenings from various forms of scrap iron. The Sacramento shops, which handle this work, turn out about 1,700,000 tie plates each year in addition to the other classes of material that are manufactured. In this case no definite figures of the savings can be arrived at, as these are dependent on the assumed prices credited to the various departments for scrap material used at the shop. It is known, however, that a considerable saving is made.

The most complete scrap reclaiming plant that has been developed is operated by the Santa Fe at Corwith, Ill., just outside of Chicago. The operation of this shop and the savings which have been made are described in considerable detail in an article in the general section of this issue. While a very large part of the material handled at Corwith is car and locomotive scrap, there are a number of interesting features in connection with the handling of maintenance scrap. No rail intended for relaying comes to Corwith, as the company operates a rail sawing mill at Newton, Kan., which handles all necessary work on second-hand rail.

The fact that all of the material handled at Corwith consists of smaller parts makes the savings that have been effected all the more noteworthy. For instance, it would seem that there would be considerable question as to the advisability of trying to reclaim track spikes and nuts, but it has been found that spikes can be reclaimed at a cost which, including the value of the scrap and all charges for operating the plant, is $1.33 per keg less than they can be bought for in the market. In the same way nuts can be reclaimed for $3.81 a keg less than their value new. The savings made on a few other typical items are as follows: $1.08 each for ballast forks, $0.84 each for claw bars, $14.80 each for track drills and $5.32 each for jacks. As an indication of the magnitude of the work which is done on maintenance scrap the value new of this material, which was reclaimed during 1912, was a little over $39,000.

In most cases the material is repaired by putting together the good parts of several pieces. The rust is removed from spikes by rattling them, and they are then straightened and sharpened. In some instances articles for use in the maintenance department can be made from scrap car and locomotive parts. In this manner picks are forged from old coupling pins and jimmy bars are made from coil springs that are too weak to be used again. By handling all scrap at one shop it is possible to make the best use possible of each piece of scrap without interfering with the proper accounting between departments.

A MAINTENANCE DEPARTMENT TESTING PLANT.*

A Suggestion for Increasing the Amount of Experimentation on Track Constructions as an Aid to Scientific Design.

By B. B. Milner.

Some time ago the writer, whose experience has been chiefly with railway motive power, was asked to assist a maintenance-of-way engineer in the investigation of a problem which involved a study of track design and the stresses imposed upon its various members. Consultation with several men of recognized experience and authority, as well as an investigation of all experimental work performed in this connection, and a search through the literature of the subject, revealed the fact that dependable data upon which to base definite conclusions upon various points raised were lacking. This same revelation was made by O. E. Selby, bridge engineer of the Cleveland, Cincinnati, Chicago & St. Louis, in writing an admirable paper, entitled "A Study of

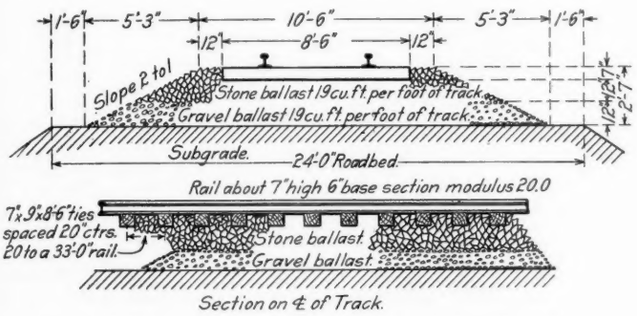


Fig. 1—Track Superstructure for 60,000 lb. Axle Loads.

the Stresses Existing in Track Superstructure and Rational Design Based Thereon," which was published in Bulletin No. 80, American Railway Engineering Association, October, 1906. This paper contained several paragraphs elaborating upon the statement that "railroad track has grown in strength as heavier loads have made increased strength necessary, but such growth has been entirely along empirical lines, and not one single detail of track superstructure bears marks of engineering design."

After careful consideration of such factors as rail loading and stress therein, tie bending, bearing of tie upon the ballast, depth of ballast and its bearing upon the subgrade, Mr. Selby developed the track design shown in Fig. 1. The sizes on the drawing are for 60,000-lb. axle loads. The principal sizes for 50,000-lb. loads, using various weights of rail, are given in Table I.

in 1899, by Railroad Director Schubert, of Berlin, of observations extending over a period of over three years, on the action of ties actually in track. This report was translated and published by W. C. Cushing, chief engineer, maintenance of way, Pennsylvania Lines, and appeared in Bulletin No. 76 of the American Railway Engineering Association, June, 1906.

In Mr. Johnson's formulæ the two following premises are made:

1. "That the width of distribution of the load is equal, for stone ballast, to the width of the tie plus the depth of the ballast, and, for gravel ballast, to the width of the tie plus half the depth of the ballast."

From Fig. 2 this premise may be algebraically expressed thus:

For gravel, $x = b' + \frac{1}{2} d'$ .....(1)
For stone, $x = b' + d'$ .....(2)

where x is the width of the ballast pyramid carrying the load.

2. "That the intensities of pressure within that width are proportional to ordinates to an arc of a circle whose radius and chord are each equal to the width of distribution of the load."

The deduction of the formulæ is as follows:

If the circular arcs be considered as approximate parabolas, the intensities of pressure may be assumed to be proportional to the ordinates of the curves. The area of the parabolic segment $= \frac{2}{3}xy$, hence the mean ordinate $= \frac{2}{3}y$; or the mean pressure $= \frac{2}{3}$ the maximum.

The pressure at b is o, hence, to obtain an approximately uniform distribution of pressure over the surface of the subgrade, the tie-spacing S must be such that the curves overlap and have a common ordinate y' equal to $\frac{1}{2}y$. This will obtain when $db = \frac{1}{4}\ cb$; $eb = \frac{1}{4}\ ab$ or $mo = \frac{3}{4}\ mn$.

Hence, the tie-spacing $S = \frac{3}{4}x$.

Therefore, from (1), for gravel,

$$S = \frac{3}{4}\ (b' + \frac{1}{2}\ d')$$

and from (2), for stone,

$$S = \frac{3}{4}\ (b' + d')$$

from which the required ballast depths d' are obtained by transposition:

For gravel, $d' = 8/3\ (S - \frac{3}{4}\ b')$
For stone, $d' = 4/3\ (S - \frac{3}{4}\ b')$

both of which give values of d' much greater than exist in practice.

The question whether, in order to strengthen our tracks for the increased loads imposed, the number of ties or the depth of ballast, or both, should be increased, is one on which opinions vary widely among those concerned. The following is here presented in this connection:

TABLE I.

Rail	80 lbs.	90 lbs.	100 lbs.	Rail with Sec. Mod. 20
Axle load	50,000 lbs.	50,000 lbs.	50,000 lbs.	60,000 lbs.
Size of ties	7 in. x 8 in. x 8½ ft.	7 in. x 8 in. x 8½ ft.	7 in. x 8 in. x 8½ ft.	7 in. x 9 in. x 8½ ft.
Spacing of ties	16½ in.	18 in.	20 in.	20 in.
Number of ties per 33 ft. rail	24	22	20	20
Depth of ballast	14 in. stone	16 in. stone	18 in. stone	12 in. stone; 12 in. gravel
Width of roadbed	21 ft.	21 ft.	22 ft.	24 ft.

From this table it is at once seen that the number of ties per 33 ft. rail, as well as the depth of ballast, is much greater than that found in standard track today, and, since the figures in the table are the result of a careful consideration of the strength of the materials involved, it is not surprising that the question of strengthening our present standard tracks is becoming such a live one, especially with our heavier trunk lines.

The depth of ballast, computed by Mr. Selby, was obtained from formulæ for the thickness of ballast necessary to produce equal distribution of axle loads on the surface of the subgrade beneath the ballast, for which Thomas H. Johnson, consulting engineer of the Pennsylvania Lines West, was responsible. Mr. Johnson deduced these formulæ after studying a report, made

Fig. 3 shows a diagrammatic section of the ordinary standard main line track, in which 7 in. by 8 in. ties are spaced 22 in. apart, or 18 per 33-ft. rail, and laid upon 6 in. of ballast. The slopes of the ballast pyramids, transmitting the load from the bottom of the tie to subgrade, are determined in accordance with Mr. Johnson's premises for the distribution of pressure at the bottom of stone ballast. It will be noted that the width of the base of the ballast pyramid under each tie is 14 in. and the width of the strip of subgrade unloaded and lying between adjacent ties is 8 in. As shown by Director Schubert's experiments, and in line

*Abstracted from the Journal of the Franklin Institute for July, 1913.

with the experience of all trackmen, the subgrade line, originally straight, will be disturbed, as *AB* in Fig. 4, the amount of disturbance being proportional to the weakness of the subgrade and to the ratio of the area of subgrade between the loaded ballast pyramids and that of subgrade beneath the ballast through which the load is transmitted.

By changing the tie-spacing to 20 in. or 20 per 33-ft. rail, as shown dotted in Fig. 3, the ratio of loaded to unloaded width of subgrade at the 6-in. depth of ballast becomes 14/6 instead of 14/8, an increase of 33⅓ per cent. The subgrade is more nearly confined, a condition which, of course, materially increases its

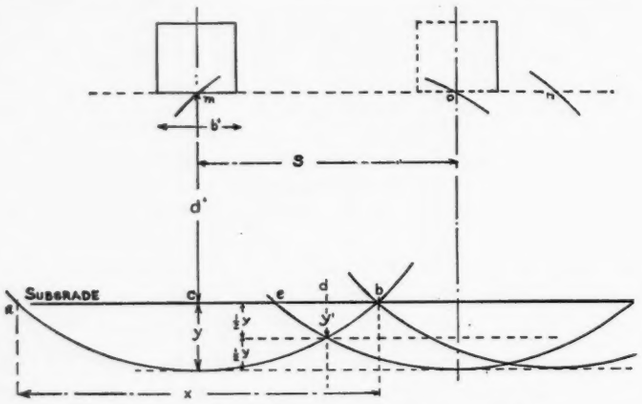


Fig. 2—Diagrammatic Section of Track.

carrying capacity. Maintaining the 22-in. tie-spacing and increasing the depth of ballast from 6 in. to 8 in. changes the ratio of loaded to unloaded width of subgrade from 14/8 to 16/6, an increase of approximately 52½ per cent.; while the combination of the decreased tie-spacing and increased ballast depth increases the original ratio from 14/8 to 16/4, or approximately 128.6 per cent.

In the diagrammatic plan of track shown in Fig. 5 it is assumed that the rail load is spread by the tie 18 in. on each side of the rail centres, or, for an 8-in. tie, over an area of 36 times 8 = 288 sq. in. of the lower face of the tie under each rail, and over somewhat less than the 36 + 6 times 8 + 6, or 588 sq. in. of the subgrade. The corresponding area of unloaded subgrade

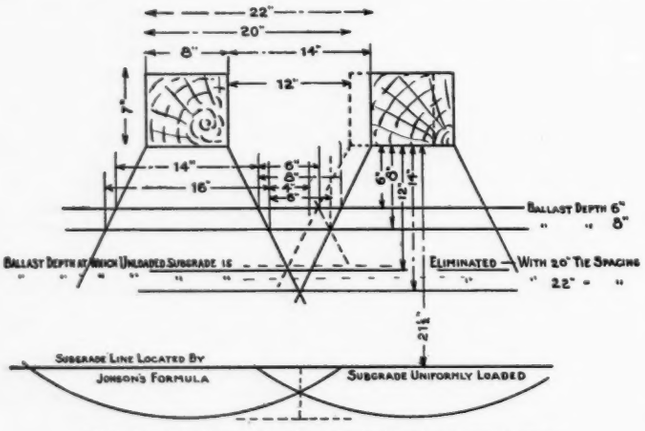


Fig. 3—Section of Standard Main Line Track.

is 42 times 8, or 336 sq. in., and the ratio of loaded to unloaded subgrade areas is 588/336. Decreasing the tie-spacing to 20 in. will increase this ratio to 558/252, or 33⅓ per cent., while combining with this decrease, an increase of ballast of 2 in., will increase the ratio to 588/168, or 100 per cent.

Fig. 5 also shows that with 18 ties per 33-ft. rail the unloaded area of subgrade between adjacent ties becomes zero when the depth of ballast is increased from 6 in. to 14 in., while with 20 ties per 33-ft. rail it becomes zero with a ballast depth of 12 in.

According to Johnson's formula for stone ballast, a uniform distribution of subgrade loading will be obtained with 21⅓ in. of ballast for 18 ties per 33-ft. rail and with 18⅔ in. of ballast for 20 ties per 33-ft. rail.

Any consideration of the relief to be expected from decreasing the tie-spacing, increasing the depth of ballast or otherwise, should take into account the cost, and in this connection Table II. is presented:

TABLE II.

STATEMENT SHOWING COMPARATIVE COST OF INCREASING THE NUMBER OF TIES PER 33 FT. RAIL FROM 18 TO 20 AND COST PER INCH DEPTH OF PUTTING ADDITIONAL BALLAST UNDER TRACK.

Ties per mile spaced	Single track	Double-track	4-track
18 per rail length	2,880	5,760	11,520
20 per rail length	3,200	6,400	12,800
Additional ties	320	640	1,280
Cost per tie:			
1 tie $0.90	Volume of one tie, 3.3 cu. ft.		
2 plates ..... .28	Cost of ballast, 75 cents per cu. yd.		
8 spikes ..... .11	Cost of laying ballast, 40 cents per cu. yd.		
$1.29	Total cost of ballast in track, $1.15 per cu. yd.		
Credit account ballast displaced. .14			
Net cost per tie $1.15			
Labor, placing tie in track .... .30			
Cost per tie in track $1.45			
Cost of additional ties in track	$464*	$928*	$1,856*
Full width of ballast base	164½ in.	324½ in.	644½ in.
Cubic yards per square inch section per mile equals 1.35			
Cubic yards ballast required	223.39	441.07	875.23
Cost of required ballast in track, at $1.15	$256.90	$507.23	$1,006.51

*Does not include labor cost of respacing present ties to make the insertion of additional ties possible, nor the cost of distributing the ties and ballast to point where placed in track.

From this table it is seen that a reduction of tie spacing from 22 in. to 20 in. increases the ratio of width of loaded to unloaded

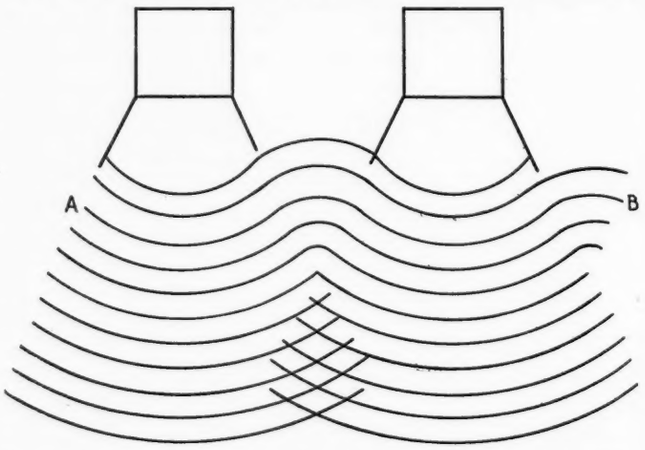


Fig. 4—Showing Distortion of Ballast Under Loaded Ties.

subgrade by 33⅓ per cent. at a cost of $464, $928, and $1,856 per mile for single, double, and four-track lines respectively, while an increase of ballast depth of 2 in. (from 6 in. to 8 in.) increases this ratio by 52½ per cent. at the respective cost of $256.90, $507.23, and $1,006.51 per inch additional ballast, or $513.80, $1,014.46, and $2,013.02 for the two inches of additional ballast. Whether the first or the second, or a combination of both, is best is therefore somewhat of an open question.

Some individuals and committees have recently recommended a ballast depth greatly in excess of previously existing standards and still greater than the ballast depths actually obtaining even on our densely travelled lines, without qualification dependent upon either the subgrades or the characteristics of the imposed loads. To the writer it appears that the design of railroad track must be approached in the same way as the design of any mechanical parts. As a foundation it should be treated like any other foundation, and a study of its requirements, purposes, construction, and maintenance should be made. It must be designed to carry loads of certain individual magnitude, density

and speed, etc., and must do this upon subgrade of given conditions. With a sufficient amount of the right kind of data, it should be possible to combine the knowledge of the loads to be imposed with that of the subgrade conditions, and prescribe the most efficient and economical track construction, which, if it cannot be immediately provided, can be approached from year to year in connection with regular track maintenance work. Subgrade conditions vary materially within short distances, but with these conditions properly charted it should be a very easy matter, in bringing the condition of the track up to a desired standard, to concentrate effort upon those sections which are farthest from that standard and which will be located from tabulated or charted data or from the frequency of service failure.

Opinions of maintenance men vary greatly upon a majority of questions relating to track and track superstructure design, and practically none of these opinions is supported by such conclusive test or experience as will make early agreement or reconciliation possible. In the maintenance-of-way department dependable data are not being collected as in the motive power department, in which department much money has been, and is continually being, profitably spent to settle questions pertaining to the design and operation of both locomotives and cars, many of which questions are of less importance than some of those relating to track construction.

The writers upon maintenance-of-way subjects will have served a useful purpose if they succeed in focusing attention upon the

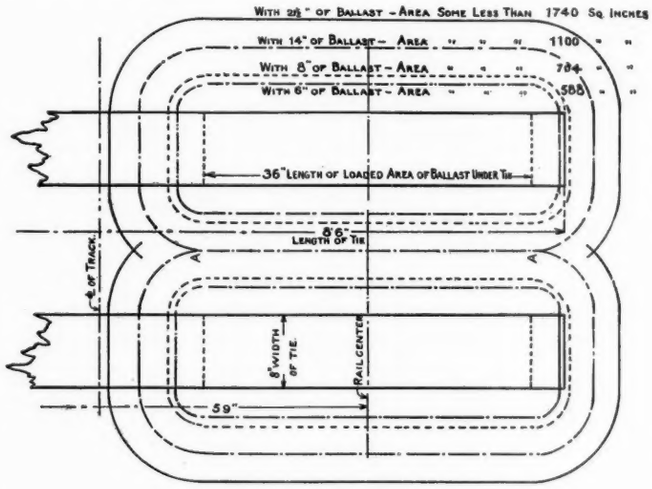

With 20½" of Ballast – Area Some Less Than 1740 Sq. Inches
With 14" of Ballast – Area " " " 1100 " "
With 8" of Ballast – Area " " " 784 " "
With 6" of Ballast – Area " " " 588 " "
36" Length of Loaded Area of Ballast Under Tie
8'6" Length of Tie
8" Width of Tie
Rail Center
59"
℄ of Track

Fig. 5—Sketch of Track Plan.

comparative deficiency of experimental work in this field, for as soon as this deficiency is realized work will be inaugurated which will in a few years elevate the science of track construction to its proper level. The condition of our tracks is now lagging behind requirements, and we cannot consistently hope for a better state of affairs unless some move along scientific lines is soon inaugurated. In the meantime, locomotive and car designers must "mark time," so far as increased loads and speeds are concerned.

While some investigations should necessarily be made under regular service, many can be (and a few have been) carried out upon an experimental track of significant proportions. An experimental track was constructed a comparatively short time ago by the Prussian State Railroads at Oranienberg, Germany, and is being used to determine experimentally the best construction. Dr. H. K. Hatt, of Purdue University, who visited this installation a few years ago, reported:

"It consists of an oval track two miles in circumference over which runs a train consisting of an electric locomotive and cars. At about every 50 ft. two vertical rail ends were sunk in the ground on each side of the track and clips riveted onto them to serve as a reference line for measurement of track deformation. The service is considered as severe in one year as eight years on the main line. The cost of the roadbed and equipment is stated to have been $40,000.

"The records of traffic passing over this experimental track show that in 369 working days the number of ton miles was about 3,700,000. In the months of January, February, March and April, 1909, there were nearly 4,350,000 ton miles. The locomotive weighed 59½ tons and would pull a train of from 240 to 375 tons. The speed of the train was about 37 miles per hour."

The loads imposed upon this experimental track are insignificant in comparison with those which, for the results obtained to be of service, would have to be placed upon such a track in this country. The writer would suggest that an experimental track be designed and constructed in the form of a figure 8, so that one loop could be operated while the other was being prepared for test. On this track, properly enclosed by fencing, etc., a motor, hauling any desired combination of cars, loaded with any desired axle loads, could be controlled from the office of an engineer of maintenance-of-way tests located in the center of either of the loops, and in this way any combination of rails, fastenings, ties, joints, ballast, frogs, switches, signals and safety devices could be tested.

The value of an ability, by this method, to rapidly test rails of different steels, under more scientific conditions, must be apparent when the amount of work done in settling rail questions during the last ten years is considered. Such a plant, with its so general benefits, could very properly be jointly constructed by interested railroads, perhaps under the direction of the American Railway Engineering Association, and tests on it carried out by some one of our educational institutions interested, in much the same way that motive-power department tests of various equipment furnished by different railroads, directly or indirectly through the Master Car Builders and Master Mechanics' Associations, have for some years been conducted at Purdue University, Lafayette, Ind.

ABSTRACT OF ENGINEERING ARTICLES SINCE JULY 18.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since July 18, 1913:

Extensive Improvements on the L. & N.—The Louisville & Nashville has under way extensive double tracking, grade revision and realinement work covering more than 300 miles of line and involving two distinct projects. The first of a series of two articles describing this work, which covers interesting construction details of the improvements between Nashville, Tenn., and Birmingham, Ala., was published in the issue of July 25, page 143. The second article describing improvements to the old line and the building of certain sections of new line between Winchester, Ky., and Jackson, was published in the issue of August 8, page 225.

Long Island Improvements at Jamaica.—The elevation of the Long Island tracks through the city of Jamaica, L. I., has been complicated by the necessity for separating grades of intersecting branches without interruption to a very heavy passenger traffic. The work included some unusual structures and a modern passenger station. August 1, page 183.

New Engine Terminals on the Western Maryland.—Two engine terminals recently built by the Western Maryland at Hagerstown, Md., and Maryland Junction, W. Va., were described in the issue of August 1, page 189.

Development of the East Indian Railway.—In an article of a general nature covering the growth of an East Indian line that now operates 2,500 miles, a number of details of construction were included. The article was published in the issue of August 1, page 191.

"Cotton Belt" Freight Terminal at St. Louis.—The new freight terminal of the "Cotton Belt" at St. Louis, including a reinforced concrete freight house, team tracks, scales, cranes and other equipment, was described in the issue of August 8, page 218.

Electric Trucks in Freight House Service.—The economies to be secured by the operation of electric freight trucks were well brought out in a description of a number of installations of these trucks published in the issue of August 8, page 236.

NEW YORK CENTRAL IMPROVEMENTS AT ROME.

Realinement Made Necessary by Construction of Barge Canal Involved Street and Stream Crossings and a New Station.

By Emile Low,
Consulting Engineer, Buffalo, N. Y.

The New York Central & Hudson River, east of Syracuse, N. Y., roughly parallels the Erie Canal, although between the crossing west of Canastota and that at Rome, the canal and the railroad are as much as four miles apart at places. The original Erie Canal, which was begun at Rome on July 4, 1817, crossed the divide between the Mohawk river and Wood Creek at Rome at its lowest point, its water elevation being 3 ft. lower than the present canal. When the first enlargement of the Erie Canal was made in 1845, its location at Rome was shifted to the north about one-half mile, skirting along the foot of a slight declivity forming the southern boundary of the town. It then turned to the south, intersecting the original canal at a small settlement known as Stanwix on the south of the valley.

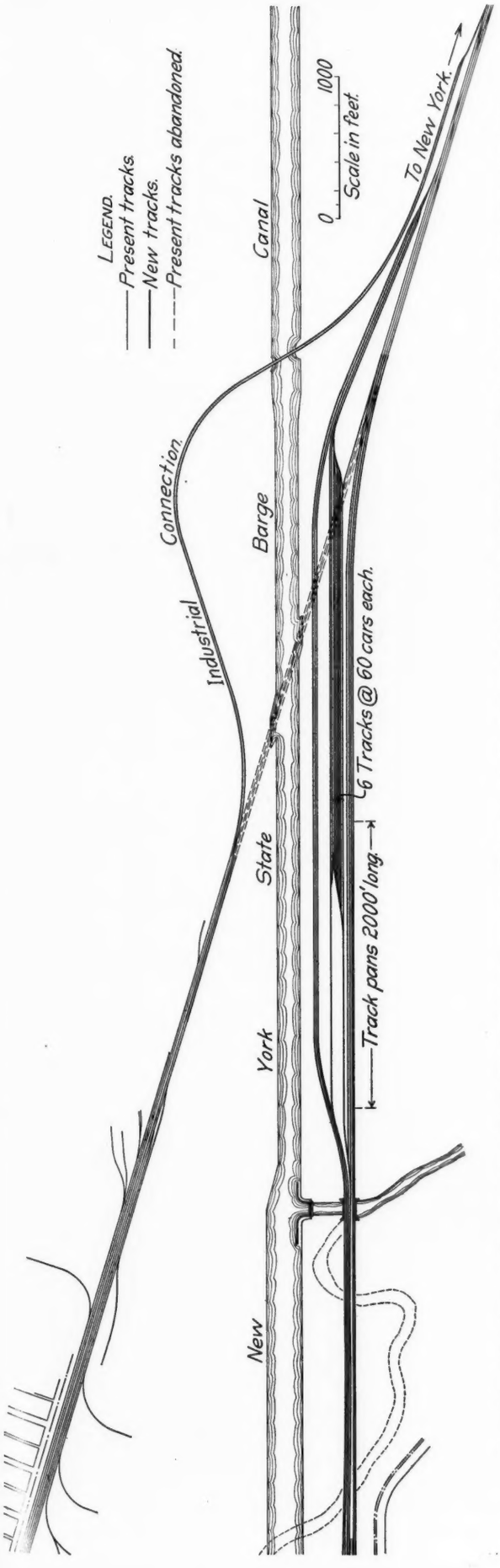
The New York Central crosses the present canal nearly at right angles, just east of the station at Rome and just west of the crossing of the Mohawk river. It recrosses the river about four miles east of Rome, running along the south bank to beyond Utica.

As in many other towns, the main industries of Rome are located along the line of the present railroad, nearly all east of the passenger station, on both sides of the track; they consist largely of copper and brass works and allied industries, and also the Rome Locomotive Works. The notable exception is the Rome Rolling Mill on the Erie Canal which has track connection with the New York, Ontario & Western. This railroad and also the Rome, Watertown & Ogdensburg, now a branch of the New York Central, connect with the New York Central at the present passenger station.

When the Barge Canal became a certainty, its location at Rome was a serious problem. The proposed ship canal from Oswego to the Hudson river was located years ago south of Rome, with two draw bridges to carry the New York Central. The writer had charge of the location of the Barge Canal at this point during the years 1904-7, and his first examination indicated that a relocation of the New York Central south of the present line was imperative with the Barge Canal about 500 ft. north of and parallel to the revised line.

After every possible location had been surveyed this plan with slight modification was adopted and is now being executed. The new line leaves the old about 9,000 ft. west of the present passenger station, by a 1 deg. 30 min. curve to the right, the curve being followed by a tangent about 3,000 ft. long, then another 1

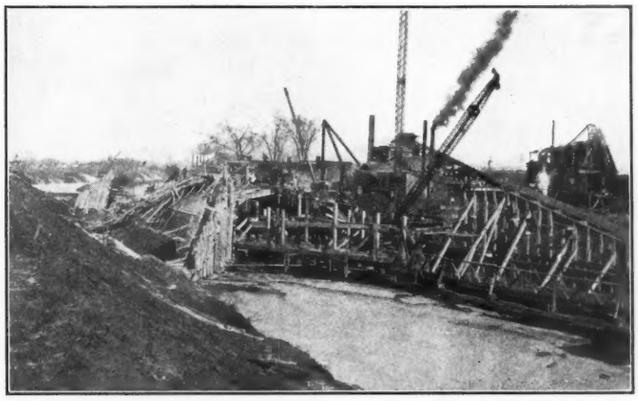
Partial Plan of New York Central Improvements at Rome, N. Y.



Remaining Portion of Plan on New York Central Improvements at Rome, N. Y., but on a Larger Scale Than the Portion Shown on the Opposite Page.

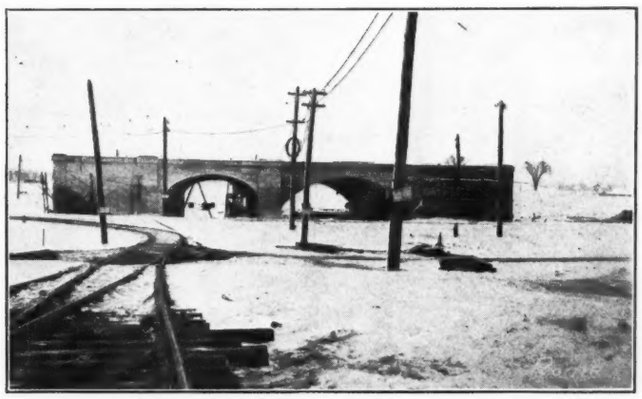
deg. 30 min. curve to the right, followed by a tangent over two miles long at the end of which a connection with the present line is made by a 1 deg. curve, the total length of the improvement being about four miles. A new connection with the R. W. & O. is being made at the eastern end of the main line change, and from this connection east the four tracks of the N. Y. C. & H. R. and the two of the R. W. & O. are side by side, making a six track line. These tracks cross James street, the old Erie Canal, Lawrence street, the New York, Ontario & Western and the present Erie Canal.

Immediately east of this canal crossing and between it and



Building the Skew Arch Over the Present Erie Canal.

Mill street is located the new passenger station on the south side of the railroad, facing a new street connecting Mill and James streets. The tracks are numbered from the south to the north. The most southerly one is the eastbound passenger, No. 2, the westbound passenger, No. 3, the westbound freight, No. 4, the eastbound freight, and Nos. 5 and 6 the R. W. & O. The island platforms will be 1,200 ft. long, one between tracks 2 and 3 serving the westbound New York Central passenger track and one between tracks 5 and 6 serving both R. W. & O. tracks. The platforms are reached by a subway and stairs. The station will be a brick structure 210 ft. long x 50 ft. wide, with all accom-



Double Arch Over Mill Street and the U. & M. V. Electric Railway.

modations for passengers on the street level. It will be set back from the tracks a sufficient distance to allow the embankment to take its natural slope and passengers will reach the track platform along the eastbound main by a covered bridge from the second story of the station.

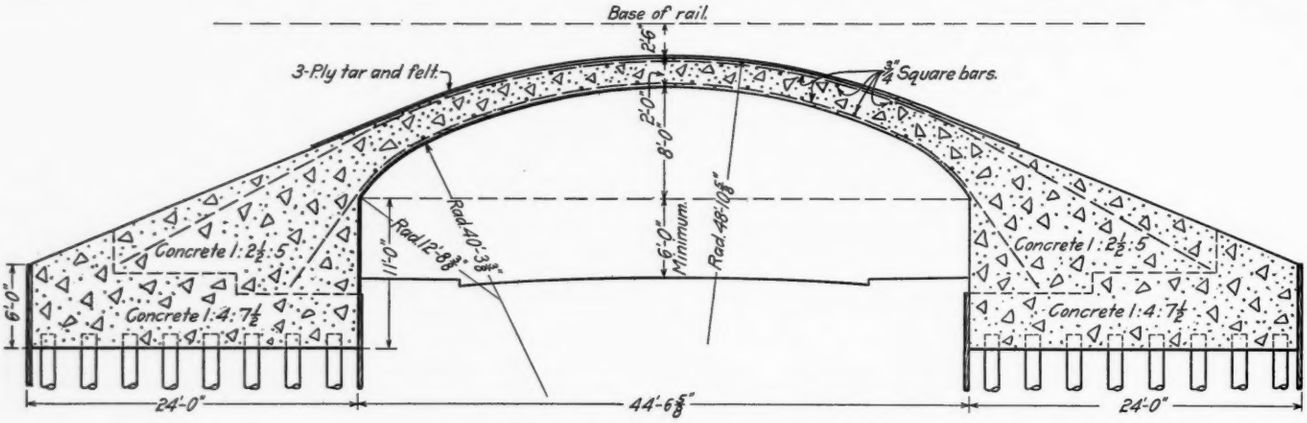
The main waiting room will be in the east end of the building, reached directly from the street by two large doors on the south side. The ticket office, which will be 40 ft. long, is located between these doors; the women's retiring and rest rooms occupy the entire east side of the main waiting room and the men's

smoking and toilet rooms, the west side. The west end of the building will be occupied by baggage and express rooms. The stairways to the eastbound track will be inside the main waiting room and the subway to the westbound track will be entered from the main waiting room level under these stairways.

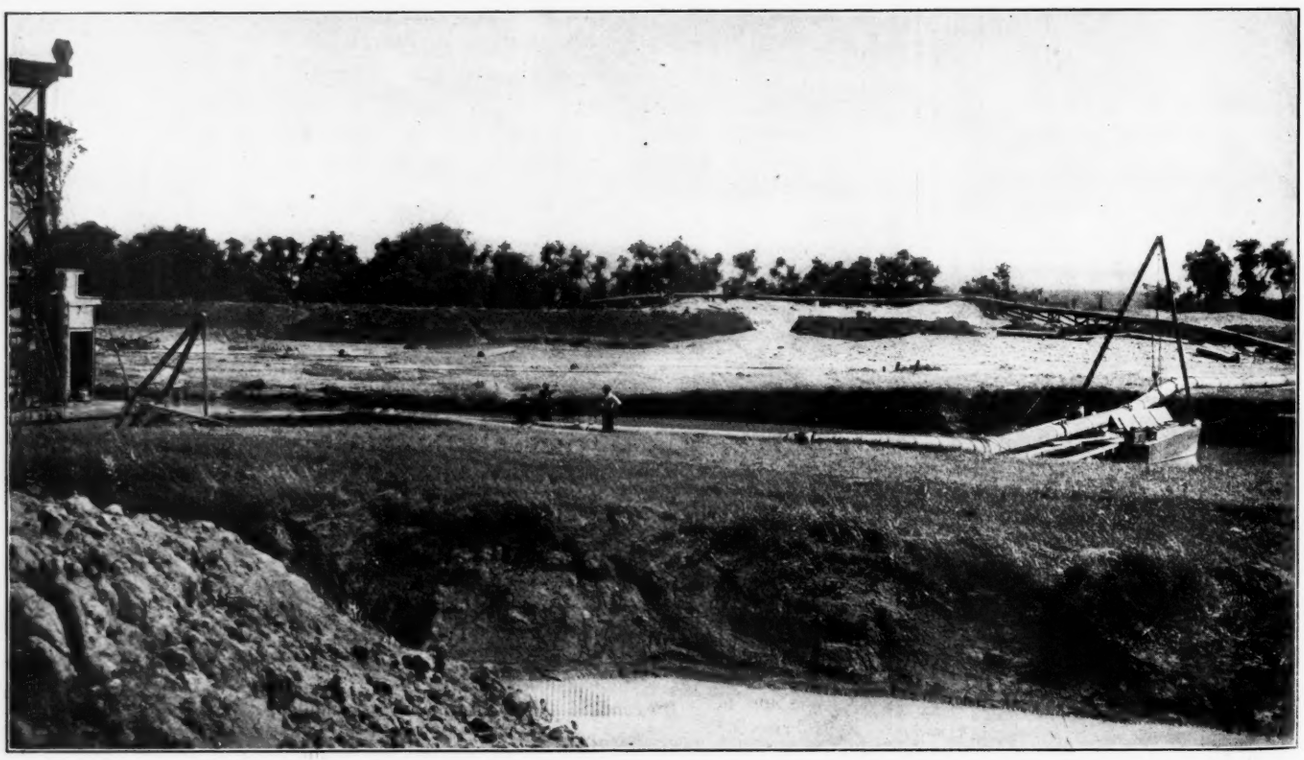
Beginning about 3,000 ft. east of the station, a six track yard with a capacity of 360 cars is located between the two freight tracks. The two N. Y. C. passenger tracks and the eastbound freight track continue straight, the other three being shifted far enough to the north to make room for the yard. A new industrial connection is being built at the east end of the improvement. It leaves the main line about 2½ miles east of the present passenger station, bearing to the right across the Barge Canal and connecting by a reverse curve with the present tracks east of the Rome Locomotive Works. This diversion was made necessary on account of the limited head room at the present crossing of the Barge Canal, and also because of the acute angle of crossing. The map shows that about one mile of the present tracks is retained west of the old passenger station and about two miles east of it, to serve the many industrial establishments located along them, and also to preserve the present connection between the New York Central and the Rome, Watertown & Ogdensburg.

The new connection for the latter road leaves it about one mile northwest of the old passenger station, just south of the crossing of the old Erie Canal, running due south about 1½ miles across the Barge Canal to a connection with the New York Central at the western end of the improvement. By means of "Ys" both easterly and westerly connections are secured. A "Y" connection is also made at the R. W. & O.

The new main line is entirely on embankment, ranging from 10 to 20 ft. high, built from material pumped from the adjacent Barge Canal by a hydraulic dredge. This section of the canal is known as Contract No. 43 and extends from Oriskany to Rome. The contractors are the M. A. Talbot Company of Baltimore, Md. The hydraulic dredge known as the "Stanwix" used on this work was built by the Morris Machine Works, of Baldwinsville, N. Y., and has a 20 in. suction and discharge. It began operations in July, 1911, and by January, 1913, had pumped 1,107,110 cu. yds. of material, partly sand, gravel, clay and muck.



Longitudinal Section of James Street Arch.

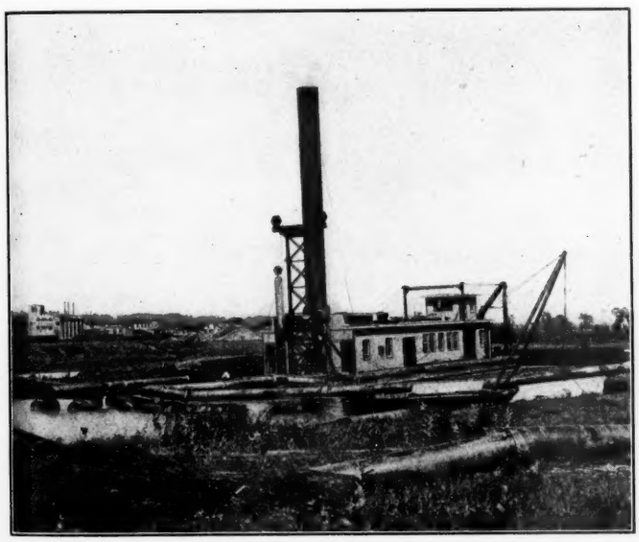


Discharge Pipe and New Embankment Being Made by Dredge.

Dikes thrown up by Lidgerwood excavators are used to retain the pumped material.

All highways are crossed overhead. The James street crossing is a reinforced concrete three centered arch, built on a skew of 53 deg. 54 min. It is 123 ft. long; the arch span is 36 ft. and the rise 8 ft. Bed rock in this vicinity is about 70 ft. below the ground surface and bearing piles are required for the support of the abutments. The piles are 35 ft. long, spaced 3 ft. in the rows and 2.5 ft. between the rows, each of the two abutments being supported by 319 piles. The normal width of the abutments is 19.5 ft. at right angles to the center line of the street and 24 ft. parallel with the center line of the arch. They are 4 ft. high on the inner faces and 8.5 ft. and 6 ft. at the back, with one step of 18 in., and another of 3 ft. The concrete in the footing and skewback is 1:4:7½.

The thickness of the arch at the crown is 24 in., at the end of the flat curve 30 in., and at the springing line, on line with the radius, 4 ft. The skewback,which is a large mass of concrete with its top tangential to the flat arch, impinges against the offsets of the foundation concrete, this weight with that of the superimposed embankment resisting the arch pressure. The transverse reinforcement for the intrados and extrados of the arch consists of ¾ in. square bars, spaced 10 in. center to center.



Hydraulic Dredge Working in New Barge Canal South of Rome, N. Y.

The longitudinal reinforcement consists of the same sized bars spaced 4 ft. center to center, staggered top and bottom. The arch concrete is 1:2½:5. The top of the arch ring and back of spandrel walls are waterproofed with three ply tar and felt, covered with a 1 in. coat of 1:2 Portland cement mortar. The top of abutments and back of wing walls are waterproofed with a ⅛ in. coat of straight run coal tar pitch. The base of rail is 2 ft. 6 in. above the top of the arch.

The Lawrence street crossing is of the same type as the one at James street. The clear span is 36 ft., and the crossing is square. The number of bearing piles is 456. The crossing of the present Erie Canal is on a skew of 40 deg. 23 min. The span taken normal to the canal is 35 ft., with a rise of 8 ft. The other general dimensions are the same as the James street arch, except the length of the barrel. A tow path is provided for on one side of the canal.

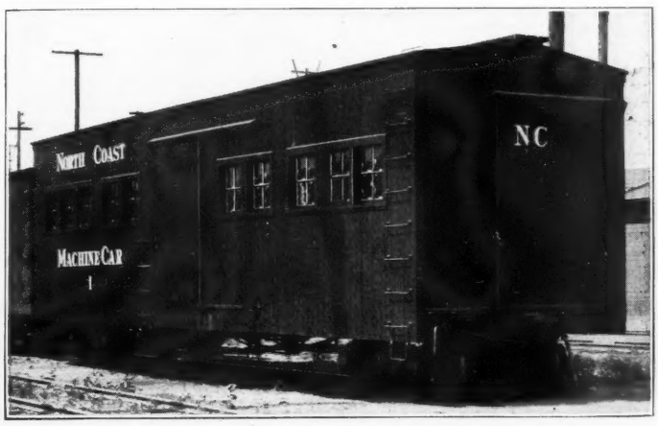
At the crossing of Mill street and the Utica & Mohawk Valley Electric a double arch is used. The Mill street arch is a counterpart of the Lawrence street arch, except in some unimportant details, the clear span being 36 ft., and the rise 9 ft. 4 in. The U. & M. V. arch has a clear span of 24 ft. and a rise of 5 ft. 6 in. There is also a crossing of the Mohawk river consisting of two 40 ft. arch spans at the Barge Canal spillway, and other minor structures at the Muck road and original Erie Canal crossing.

The crossing of the Barge Canal on the Rome, Watertown & Ogdensburg connection is a double track bridge with two deck plate girder approaches. The crossing is slightly skewed and the canal at this point is 130 ft. wide, which is 55 ft. more than the normal width. The two piers are founded on 74 bearing piles each, variously spaced from 30 to 42 in., a maximum loading of 20 tons per pile being allowed for. The concrete in the pier stems is 1:3:6. The copings are 1:1:2.

This improvement work is being carried out under the direction of George W. Kittredge, chief engineer of the New York Central & Hudson River and allied lines.

A MACHINE CAR FOR CONSTRUCTION WORK.

In connection with the construction of the North Coast lines in Washington, a machine car was built to provide repair shop facilities for general use in connection with the laying of new track or other construction work remote from such facilities. The car is 39 ft. 10 in. long, 9 ft. 6 in. wide and 9 ft. high, in-



Exterior of North Coast Machine Car.

side dimensions. It was equipped with a 12 h. p. Fairbanks-Morse oil cooled vertical gasolene engine, which was connected to a friction clutch and to the wheels of the car by sprockets

Interior of Machine Car.

and chain, making it self-propelling. In actual practice this car did considerable light switching and moved from one station to another under its own power, being able to maintain a speed of 8 or 10 miles an hour.

Among the tools contained in the car were one 23 in. engine lathe, one 16 in. shaper, one 1½ in. bolt cutter, one 6 in. pipe threading machine, one emery wheel and one 22 in. vertical drill. With these tools, practically all kinds of repair work incident to track laying and ballasting operations was carried on. About 4 gal. of gasolene were required to run the shop machinery upon the average repair work with two men working for a period of 12.5 hours. The car was found to be very efficient and useful upon the work when properly operated and maintained.

REINFORCED CONCRETE TELEGRAPH POLES.*

On the New York terminal division of the Pennsylvania a concrete pole line has been built along the right-of-way across a continuous five-mile stretch of semi-tidal swamp-land known as the "Hackensack Meadows." The ground surface is covered with a heavy growth of reeds, and the top stratum is a peaty bog from 8 to 15 ft. deep, underlain with varying strata of clay, fine sand, and mixed sand and clay for very considerable depths. The problem was to provide a design of pole which would not only be strong in itself, but which could be set in a stable foundation in soft and uncertain ground. It was desired to make the line entirely secure against interruption by severe storms or by fires in the swamp reeds. It appeared, under these conditions, that the ordinary type of wooden pole would not be wholly satisfactory, either as regards strength for such heavy service, or safety as regards the frequent meadow fires.

Reinforced concrete poles seemed to be adapted to the purpose, but very little reliable data about either the cost or service from such design was obtainable. A simple form of reinforced concrete pole was designed which could be manufactured on or near the work at a cost which would not be prohibitive. Without previous data to go upon, the design was somewhat experimental, and probably will not be of very great assistance in fixing a precedent for an ordinary telegraph pole, as the conditions called for heavier construction than usually required for such lines.

The line required 202 poles, spaced from 70 to 135 ft. apart, with an average standard spacing of 120 ft., the variations in span being due to numerous railway and highway crossings. The height of the top of poles above the ground also varies from 25 to 50 ft., and the total length of poles from 35 to 65 ft. The loading called for an ultimate capacity of 60 open telegraph wires, two 40-pair telephone cables, and one signal control cable. The open wires are of copper, No. 7 and 8, B. & S. gage, and the cables No. 13 and 16 B. & S. gage insulated wires, with a lead covering. The cables are carried by steel messenger wires. The weight of the wires and cables is 10½ lbs. per running ft., giving a total loading for the average span of 1,268 lbs. per pole, or, including cross-arms, insulators, brackets, and fittings, 1,500 lbs. per pole. In addition to this static vertical loading, emergency conditions were assumed of an extra loading of ½ in. of ice on the wires and a wind pressure of 8 lbs. per sq. ft. on wires and 13 lbs. per sq. ft. on the poles. The stresses under these conditions are not to exceed the elastic limits of the wires and of the carrying structures. These assumptions are equivalent to a vertical loading of 7,600 lbs. per pole and a horizontal force of 4,000 lbs. exerted one foot below the pole top. The normal sag of the wires at 60 deg. F. temperature is 4½ in., and a normal tension of 273 lbs. for No. 8 wires and 130 lbs. for No. 9. The maximum hot sag at 130 deg. F. is 11 in.; the tension in the wires under maximum wind-pressure with the ice loading and at 20 deg. F., is 702 lbs. and 470 lbs. respectively, for the two sizes of wires.

The design adopted is that of a tapering smooth-surface, reinforced concrete pole, square in cross-section, with chamfered corners and having a taper of ½ in. in 5 ft. The concrete is of 1½:2:4 mixture, assumed to have an ultimate strength in compression of 2,000 lbs. per sq. in. The reinforcement is composed of mechanical bond bars tied into a square skeleton frame, and in the complete pole this reinforcement is covered by a 1-in. minimum thickness of concrete.

In order to manufacture the poles economically, a yard was established adjacent to the right-of-way and with sidetrack connections for delivery of materials. The ground was leveled and set with stringer pieces, 3 ft. apart, of old wooden car sills, so as to furnish a convenient surface upon which to erect timber forms. This yard permitted of the simultaneous manufacture of 6 poles and the storing in place of 90 poles during the period of seasoning. In the process of manufacture the skeleton reinforcement is first made up, the twisted steel mechanical bond bars being tied together to form a square skeleton frame; this frame is then suspended at the proper height above the ground and the sectional wooden frames put in position around it. The concrete mixture is then poured in and carefully tamped. In this way six poles were made per day and were left in place at least sixteen days to season.

After a number of experiments it was found best to set the poles in pits excavated in the marshy stratum. These pits were generally about 9 ft. square and 5 ft. deep. A timber grillage was placed around the base of each pole about 5 ft. below the top of the ground. This grillage consisted of 6 cross ties bolted together and to the pole, and partly planked over by 3-in. rough lumber. The pole, which projected below the grillage and was pointed at the butt, was jetted down by compressed air into the sandy layer, so that the grillage would rest at the bottom of the pit. The pits were then backfilled with rock and clay. Poles on curves are cross-guyed, and the terminal and railway crossing poles are head-guyed with steel cables.

In order to determine the stability of the foundations, as above described, as well as the transverse strength of the pole itself, a test was made of a 55-ft. pole set in a 13-ft. foundation. The test consisted in applying a horizontal pull 39.5 ft. from the ground. The breaking load was 4,360 lbs., and the point of fracture 20 ft. from the ground, at the top of the 32-ft. reinforcement bars. The foundation itself was found to be amply secure.

The actual cost of labor and material for manufacture of these poles, reduced to a unit cost for an average length pole of 40 ft., weighing 7,600 lbs., was as follows:

Forms—labor and material	$19.00
Concrete—labor and material	26.50
Reinforcement—labor and material	32.00
Total per pole	$77.50

The above does not include cost of preparing site, engineering, etc., and is for the bare poles without fittings or foundation timbers. To obtain the cost of the poles erected, there must be added the cost of loading, distribution, foundations and setting, cross-arms, and fittings, but these items were special to the particular location and would be of little use as a matter of general information. It might be stated, however, that the cost of handling and erecting these heavy poles was considerably more than would be the case for wooden poles; furthermore, care must be taken in loading and unloading them, and special appliances are required for their erection.

In the special case in question it was figured that the cost of the line erected complete was not greatly in excess of that of an equally stable wooden pole line, as, in order to meet such a condition, it would have been necessary to employ "H" frame poles and set them in equally expensive foundation pits. In the case of this line it is interesting to note that the foundations and setting cost considerably more than the poles themselves.

*Abstract from a paper by George Gibbs, chief engineer electric traction, Long Island R. R., in *Portland Cement*, October, 1912.

METHODS OF HANDLING LIGHT EARTHWORK.

Experience Gained in Moving 330,000 Cu. Yds. on 14 Miles of Line, Including Details of Force Employed and Cost of Work.

By H. C. Landon,
General Manager, Watauga & Yadkin River Railroad Co., North Wilkesboro, N. C.

The equipment necessary to grade a railroad depends largely on its location with reference to connections with other roads, the characteristics of the profile and the yardage to be moved in the several cuts to make the fills. In the construction of the Watauga & Yadkin River Railroad, which is building from North Wilkesboro, N. C., westward toward Boone, the fills are generally light and the cuts are not very heavy, although there are some comparatively heavy side hill cuts with a large percentage of rock. The difficulty of moving steam shovels far into this country on account of the very poor roads and lack of bridges, eliminated them from consideration, and a study of the profile

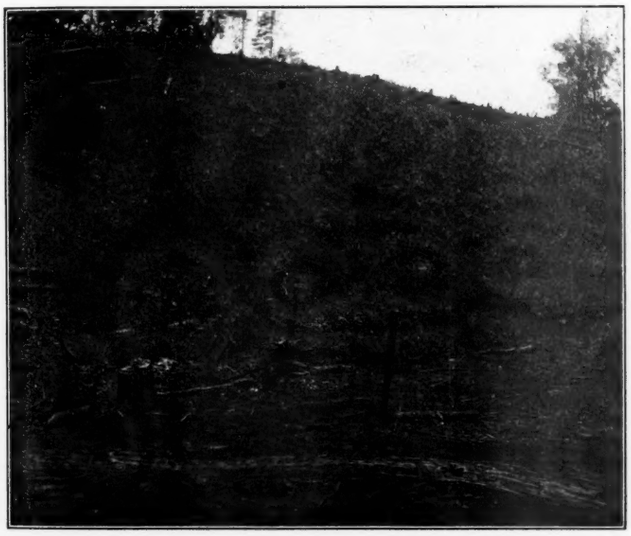


Fig. 1—Appearance of Cut Before Explosion

therefore determined that the greater portion of the earth and rock must be moved with drag scrapers, wheel scrapers and explosives.

SCRAPERS.

The drag scraper can be used for very short hauls, but it was soon found that wheelers should be used for hauls over 50 ft., except in special locations where it is desired to move earth quickly and the distance is very short. A motion study developed the fact that with drag scrapers the speed of the mules was not over 7,200 ft. per hour, with a haul of 150 ft. on account of the frequent stopping to load the drag, and with a scraper force of six teams and a plow team the cost was about $0.20 per cu. yd. When the distance was not greater than 50 to 70 ft. the cost of moving by drag scrapers was not more than $0.12 per cu. yd., and earth has been moved for about $0.11 per cu. yd., where little or no plowing was necessary. Observations made on 110 ft. hauls with drag scrapers indicated that under the best conditions 25½ trips were made per hour, giving a speed of 5,600 ft. per hour and approximately 25 yds. per team at a cost of $0.17 per cu. yd.

As a general proposition the drag scraper is expensive in moving earth and should not be considered. A few drags on the job, however, are valuable and convenient, especially for special purposes. In one instance it was questionable whether it would not be cheaper to make a fill with drag scrapers from a borrow pit alongside and waste earth from a cut approximately 600 ft. away. It developed that the cost to make the fill from the adjoining borrow pit was approximately $0.12 per cu. yd., while the cost of hauling the material from the cut with wheelers was only $0.14 per cu. yd. To waste the cut and make the fill with drag scrapers would have cost not less than $0.24 per yd.

Observation of the wheeler forces showed that the speed of the wheelers with the above haul was about 133 ft. per min., or about 1.5 miles per hour. An average of 300 yds. per day was handled with this wheeler force of one foreman, nine wheelers, one plowman, one loader, one dumper, one snatch team and one four mule plow team, at a total cost of approximately $34 per day. This force, therefore, handled 300 cu. yds. at an approximate cost of $0.146 per yd., and the amount handled could probably be increased if some system of premiums were devised. The low cost per team is due to the fact that the company owns its own teams and that $3 per day is considered a high price for teams in the locality in which this road is being constructed.

Careful observation showed that with a haul of 300 ft., nine wheelers averaged 55 cu. yd. per day per wheeler at a cost per cu. yd. very little above $0.09. The material handled was river bottom material, which is easily plowed and not difficult to handle, or a side hill cut with a sub soil of a reddish clay not much more expensive to handle than river bottom soil. Thirteen wheelers with 800 ft. average haul handled 300 cu. yds. per day at a cost of $0.168 per cu. yd. With this haul it was cheaper to move the material out of the cut into a fill than at-

Fig. 2—Cut Opened by Explosion.

tempt to make the fill from the side ditch alongside, provided it was necessary to waste the material in the cut.

The advantage of the wheeler is in its capacity. The drag scraper requires from eight to ten loads per yd., while a No. 2½ wheeler requires but little more than two loads. The average speed of the teams operating wheelers in general is about 1.5 to 1.9 miles per hour, and on long hauls where there is no delay in loading, teams will make an average speed of 2.3 miles. On December 31, 1912, observation was made of two wheeler forces, both handling stiff red clay on side hill work. In the first instance, the force consisting of one plow team, one snatch

team and six wheelers, with an average haul of 415 ft., made four trips in exactly 20 min., traveling through some mud, or at a speed of 9,960 ft., or 1.9 miles per hour. The second wheeler force using nine wheelers, one plow team, one snatch team and with an average haul of 510 ft. made seven trips in 47 min., equal to 1.7 miles per hour. Each wheeler in the first force should, therefore, make approximately 12 trips per hour, or 120 trips per day and handle nearly 60 yds. of material. In checking the record of one-half day this was approximately what the teams were doing. The longer haul should have been made with greater speed per hour, but the condition of the ground over which the material was deposited made the movement somewhat slower than that of the other force. Even at this rate the labor cost per cubic yard would not very much exceed $0.10, and under these conditions each team would handle 89 loads per day, or nearly 44 yds. per team.

With good teams and careful arrangement of the work the cost of wheeler work, even with hauls of 600 or 800 ft., can be kept down to a moderate price, provided the material is earth and can be plowed without much difficulty. The handling of material with drag scrapers where there is much rock is not very successful, although cuts have been handled successfully where material had to be blasted.

DUMP CARS.

Four small dump cars of 2 yds. capacity were used in the work. As it was difficult to get light steel rails, wooden rails made of 4 in. x 4 in. timbers were provided. These cars were used to move rock at a tunnel approach and in short cuts where most of the material was rock, which was required for the fills. The cars were loaded by hand and the hauls averaged about 250 ft. The cost per cubic yard with this haul did not exceed $0.17. Where the haul was over 100 ft. the average gang loading cars, including drillers, was 14 men. This force would move about 150 yds., largely rock, at a cost of about $25.

Dump carts for short hauls, of approximately 100 cu. ft. capacity, have proved very convenient for disposing of earth, where the haul was short and speed was not a requirement. The average gang employed loading carts was about ten men, and such a gang would handle 75 cu. yds. per day at a cost of approximately $19.50.

POWDER AND EXPLOSIVES.

The location of the line being largely on side hills and in places where there was little or no danger in moving earth and rock with powder, it was decided to move a large portion of the side hill cuts by this means. Up to this date approximately 5,000 kegs of powder have been used, moving approximately 50,000 cu. yds. At first it was difficult to get the foremen to use the powder, but we finally succeeded in arranging the work so that the entire section lying between the small runs on the hillside was drilled with the proper number of holes; about on the center line, if in soft rock, or near the ditch line, if in hard rock, and from 10 to 17 ft. apart, depending upon the depth of the cut. These side hill sections were usually from 300 to 400 ft. in length, requiring from 30 to 40 holes. A No. 3 blasting machine was ordinarily ample to handle the shots. The first order of powder was for only 400 kegs, which was used in small units, but to very good advantage, moving approximately one yard of rock to every 2 lbs. of powder used.

One 80 ft. cut offered a serious problem. After a study of the situation it was decided that it might be possible to construct powder tunnels and blow off the top of the hill, thereby making an open cut. The line crossed a narrow ridge on a sharp skew which would enable the powder if properly used to throw the material away from the line. The first attempt was made at the west end of the cut, tunnels being driven at right angles to the line to the ditch line, and then both ways on the ditch line approximately 25 ft. above grade. It was supposed that a thorough study had been made of the material, which was generally stiff hard clay or rotten rock, but it developed that a very hard rock existed on the west end of the tunnel parallel to the line. This disturbed the calculations somewhat. Only 400 kegs of powder were used to make the blast, the powder being placed in paper flour sacks and loaded in a compact manner in the tunnel, approximately filling it, the tunnel being 4 ft. wide and 5½ ft. high. Electric exploders attached to five or six sticks of dynamite were placed in the tunnel at intervals of approximately 25 ft. on the connecting wire lines. The end of the tunnel was tamped very thoroughly. The explosion which followed moved a large amount of earth, and earth which would have had to be removed finally to get to the mouth of a tunnel, which is now being constructed. However, while about 8,000 cu. yds. of material was moved the blast did not do the work expected. The hard rock west of the main tunnel proved of such great resistance that scarcely any material was moved at the summit of the cut, indicating that not enough powder had been used at any point in the tunnel and that the powder tunnels were not properly loaded to move the earth above and beyond the tunnels. The tunnel at the east end was then more carefully planned. Small tunnels were extended out 25 ft. at right angles to the main bore so as to reach approximately the north ditch line. The powder tunnel indicated that most of the material was rotten granite rock, not very difficult to move. It was estimated that about 15,000 yds. were to be moved and it was decided to use only 20,000 lbs. of powder. This powder was loaded in the tunnel in paper sacks as in the previous case. The exploders and the line were placed in the tunnel at approximately the same intervals as in the first instance and were all carefully tested. The total length of this tunnel was 245 ft., the powder filling all but 30 ft. of it. This blast moved approximately 14,000 yds. of earth. Two of the photographs show the west end of the tunnel before and after the shot.

Several other large blasts have been successfully made along the route in side hill cuts on different sections of the line, moving almost one-half yard of material for every pound of powder used. In one cut, estimated at 8,000 yds., 95 per cent. of which was solid rock, 33 holes were driven in two rows, the upper row being approximately 20 ft. deep and extending 2 ft. below grade, while the lower holes were 16 ft. deep, extending 6 ft. below grade. The holes were expanded twice; first by using five or six sticks of dynamite, and then by using 25 or 30 sticks. This material was all rock, and the second expansion of the holes was necessary, although it is believed that one expansion of the holes, using 10 or 12 sticks of dynamite would have given better results, as the second expansion tended to fill the holes rather than open them up to sufficient size. An average of 11 kegs of powder was used in expanding the upper holes and 13 in the lower holes. The results of this blast were very satisfactory, 378 kegs of powder being used, moving fully 7,000 cu. yds. of rock. A No. 3 push down battery was used in this explosion, although this was overloading the battery slightly.

In all the smaller shots that are being made, the foremen are instructed to use powder judiciously, and they are getting good results with a minimum amount of powder. The holes are made on the center line to a point about 2 ft. below the grade line and are spaced a distance apart equal to the depth of the holes. It is found that the holes drilled on the center line and to this depth below the grade will ordinarily pull down the grade about the amount desired, and will not move the earth too far back of the slope line where soft rock is handled. In some locations where we have encountered a very hard granite the upper holes are placed on the ditch line. Steam drills are used with hard rock, while a large percentage of the other holes are put down by hand and churn drills.

The total yardage in grading 14 miles of the road is 330,000 cu. yds., 20 per cent. of which is rock. This was moved with an average of 72 teams, 200 men, 150,000 lbs. of powder and ten tons of dynamite in less than six months. The average labor cost of moving earth was $0.15, and rock, $0.36. The wages paid for common labor were $1.40 per day, drillers $1.60, and hired teams $3 per day.

THE OIL ENGINE IN RAILWAY WATER SERVICE.

BY C. R. KNOWLES,
General Foreman Waterworks, Illinois Central, Chicago.

Internal combustion engines using gasolene as a fuel have been used by railway water service departments for a good many years with varying success, depending largely on the care and attention given the engines. The advantages claimed for an engine of this type over one driven by steam are: Lower first cost; less floor space required; can be started more quickly than by firing up a boiler; economy in handling of fuel; proper installation presents a better fire risk; requires less attention. The latter feature is the principal claim to economy in a gasolene engine as by eliminating the services of a regular pumper, and giving the operation of the engine over to some employee in connection with other duties, the charge for attendance is only nominal and the cost of operation is reduced.

The possibility of operating a gasolene engine with little or no attention has caused many users to believe that such engines can be run without any attention whatever, except that required to start. Consequently the operation of the engines in many instances has been turned over to men wholly incapable of properly handling any machinery, and possessing no qualification except that of being conveniently located. The result has been a high cost for repairs and frequent delays and interruption to service, which destroy the saving that should be expected. The increasing cost of gasolene has cut down this margin of saving until it has become necessary to look for some other fuel as a substitute, and this problem seems to have been partially solved by the use of low grade oils, such as kerosene and power distillates. The necessity for using such oils has resulted in great activity on the part of the builders of oil engines and in the designing of attachments to permit the burning of low grade oils in gasolene engines.

In the course of development of the oil engine widely different types were evolved. In one type, known as the Diesel, the oil is injected into the cylinder by an enormous air pressure, and the heat raised by compression is sufficient to burn the oil instantly as it enters the cylinder. The types which we have to deal with, however, may be divided into two general classes, first a modified form of the above engine which may be known as a two-cycle valveless injection engine in which the compression has been reduced, adding the required temperature in a heated combustion chamber.

The engine is governed by throttling the oil supply and ignition is accomplished by the hot tube method, a common form being by means of a hollow hot ball. This hot ball is heated by a blow torch before starting, and after the engine is running the heat is maintained by the successive explosions of the engine. The cycle of operation is as follows: The air is drawn into the crank case by the up stroke of the piston through a port located just below the exhaust port, and is compressed slightly on the downward stroke of the piston. During the latter part of this stroke the inlet port of the cylinder from the crank case is open and the air is forced into the cylinder against a baffle plate on top of the piston which directs it to the upper part of the explosion chamber, partially scavenging the cylinder of dead gases. On the up stroke the piston compresses the confined air into the explosion chamber and ignitor ball, and at the same time an oil spray is discharged into the cylinder at high pressure by the oil pump. The temperature of this mixture of air and oil is raised by the heat generated by compression, assisted by the heat given off by the walls of the cylinder and head, ignition is caused by the ignitor ball, the explosion occurs, and the piston is forced downward on the power stroke. This operation is repeated at every revolution of the engine.

Engines of this type which inject liquid oil into the cylinder are liable to carbon trouble and resultant deterioration, due to the fact that an excess of oil injected into the cylinder breaks up into volatile compounds, such as the naphthas, heavy tar-like oils, and free carbon. Improper lubrication also will cause carbon trouble. The high speeds and temperature at which oil engines work necessitate a continuous and skillful use of good oil. A great deal depends upon the proper lubrication of an engine of this type and the prevention of carbon forming in the cylinder. The destruction of the lubricating oil by combustion cannot be prevented and just what occurs to the oil in an internal combustion engine cannot be entirely explained, but there is no doubt that a great deal of it is burned along with the fuel oil, and as long as this is true it is necessary that complete combustion take place in order to prevent the residue of unburnt oil being left in the cylinder in the form of carbon. The greater the amount of carbon in the oil the greater the amount of air necessary to form complete combustion.

The lubrication of a steam engine or pump is comparatively simple. In steam engines there is generally a certain amount of water, but the flames of an oil engine dry the internal surfaces and unless the proper amount of oil is applied the cylinder, piston, and rings soon begin to suffer. In a steam engine or pump the temperature will reach at the most about 500 deg., while in an oil engine it rises as high as 2,500 deg. Added to this is the fact that the piston speed of an internal combustion engine is from three to four times that of a steam engine or pump, and consequently the oil engine requires a different method of lubrication and a great deal more of it. Another cause of carbon formation is an overload. When the engine is working up to its maximum power a momentary overload will cause an excess of oil and resultant accumulation of carbon due to the fact that the oil engine is not flexible enough to adjust itself instantly to the varying loads as is a steam engine or pump.

Another common type of engine burning the low grade oils operates on the well known four-cycle principle, consisting of four strokes of the piston or two revolutions of the crank. During the first outward stroke, which is called the suction stroke, the air is sucked into the cylinder and fuel is either pulled in with air or in some types injected by a pump, as with the two-cycle above described. This is followed by the return or compression stroke during which the piston compresses the charge. Ignition is accomplished by electric spark or by hot surface forcing the piston on its second outward or working stroke. The cycle is completed by the second return stroke of the piston, called the exhaust or scavenging stroke, during which the burnt gases are expelled from the cylinder through the exhaust valve.

Gasolene engines now in service are being converted into oil burning engines by the addition of attachments for preheating the oil to the flashing point before the oil enters the cylinder. These attachments consist of generators, or mixing chambers, where the oil is heated by the exhaust of the engine, and are made in various sizes and types both for throttling and hit-and-miss governors. With these attachments the engine is generally started on gasolene and allowed to run until the cylinder and generator are heated, when the oil is cut in. On other types a retort is provided where the oil is converted into a vapor or gas by heating the retort with a blow torch. Either method requires from five to ten minutes to start the engine running on oil. Very little carbon trouble is experienced with the use of these attachments and the lubrication required is about the same as with a gasolene engine.

A series of tests was made pumping from an 8 in. well 190 ft. deep, lifting water against 15 in. of vacuum, the total head being 61 ft., with an 8 in. x 10 in. single cylinder direct acting pump direct-connected to a 6 h. p. four-cycle horizontal gasolene engine equipped to run on kerosene and distillates as well

as gasolene. The engine was controlled by a throttling governor.

The fuels used were:

	Specific Gravity.	Flash.	Burn.
Distillate	40 deg. Baume	150 deg.	170 deg.
Methyl alcohol	40.5 deg. Baume	Same temperature	
Kerosene	46 deg. Baume	124 deg.	145 deg.
Gasolene	62 deg. Baume	Same temperature	
Motor spirits	58 deg. Baume	Same temperature	

EFFICIENCY TESTS.

	Distillate.	Alcohol.	Kerosene.	Gasolene.	Motor Spirits.
Lbs. fuel per hour	5.145	6.062	4.943	5.373	4.755
Cost fuel per hour, cents	.0347	.35	.06	.1313	.0975
Pump, r. p. m.	43.36	43.32	43.54	43.72	43.79
Pumped, g. p. m.	175.0	177.8	176.8	176.8	178.1
Water, horse power	2.69	2.73	2.72	2.72	2.74
Lbs. fuel per h. p. h.	1.91	2.22	1.91	1.97	1.74
Cost fuel per h.p.h., cents	.0129	.1282	.0220	.0483	.0356
Cost fuel per gal., cents	.04625	.40	.08	.15	.13
Pints per hour	6	7	6	7	6
Temperature cyl. start.	165 deg.	90 deg.	135 deg.	46 deg.	46 deg.
Temperature cyl. running	145 deg.	145 deg.	145 deg.	130 deg.	125 deg.
Temperature inlet air	110 deg.	125 deg.	120 deg.	60 deg.	60 deg.

As will be seen from the above figures the distillate is the most economical of the fuels used, the cost per water horse power hour being 53 per cent. of the cost of pumping with kerosene, and only 27 per cent. of the cost of pumping with gasolene. This engine has been successfully operated on distillates from 36 deg. to 42 deg. Baume for a period of three years. The high cost of alcohol eliminates it as a fuel for pumping water and the results of this test are submitted merely for comparison. No doubt better results could have been obtained by reducing the area of the combustion chamber, as more compression is required to secure economical results with alcohol in internal combustion engines. The results obtained from the use of kerosene were practically the same as from the distillate, the only difference being in the price of the two fuels. The gasolene test shows such results as might be obtained from the average gasolene engine under the same conditions. The fuel known as motor spirits, recently produced as a substitute for gasolene, operates under the same conditions as gasolene. The only objectionable feature about this oil is a disagreeable odor which would perhaps make it undesirable in certain localities.

A 12 h. p. four-cycle gasolene engine with hit-and-miss governor pulling a 7½ x 24 in. working barrel in a deep well was equipped with a generator for burning low grade oils. Comparative tests showed that the engine consumed the same amount of 39 deg. distillate per h. p. h. as gasolene, the difference in cost of the fuels showing a saving of .0434 cents per h. p. h. in favor of the distillate. The cost of pumping water at this point is comparatively high, due to the fact that the water is pumped with a single-acting deep well cylinder which is not as economical as pumping with a surface pump.

The tabulated results of this test follow:

	Gasolene.	Distillate.
Lbs. fuel per hour	11.746	12.005
Cost fuel per hour, cents	21.875	8.093
Pump, r. p. m.	24	24
Pumped, g. p. m.	124	124
Water h. p.	3.4	3.4
Lbs. fuel per h. p. h.	3.458	3.53
Cost fuel per h. p. h., cents	.0643	.0209
Cost fuel per gal., cents	.125	.04625
Pints per hour	14	14
Cost per 1,000 gals. water, cents	.029	.0108

A test was conducted for a period of 30 days on two 20 h. p. vertical, two-cycle three-port valveless engines, direct-connected with clutch to a 9 in. x 10 in. single-acting triplex pump. During the test the engines were run alternately, one pumping days and one nights, each engine running an average of 10 hours out of 24. No effort was made to prime the test, the object being merely to show the actual figures under average working conditions.

A total of 10,684,452 gal. of water was pumped against a head of 69 ft. at a cost of $50.20 for oil and lubricants. The fuel used was 39 deg. Baume power distillate, flash 126, fire 160, cost per gallon in tank car lots $.04625. The engines ran smoothly and maintained practically a constant speed, the variations in speed from readings taken from time to time during the test being from 398 to 403 r. p. m. No repairs of any kind were necessary and the formation of carbon in cylinders was not noticeable. However, the two mufflers showed a deposit of several pounds of dry carbon.

The tabulated results of the test follow:

Duration of test	30 days
Total number of hours	609
Amount of distillate used	803 gals.
Cylinder lubricating oil	46 gals.
Other lubricating oil	3 gals.
Kerosene	31 gals.
Speed of engine	400 r. p. m.
H. p. developed	6.76
Actual water pumped	10,684,452 gals.
Total head	69 ft.
Total gallons delivered per minute	292.5
Actual water horse power	5.07
Total actual h. p. h.	3,087
Pounds of oil per h. p. h.	1.025
Cost oil and lubricants per h. p. h.	.00857
Cost of fuel oil per h. p. h.	.006
Cost fuel oil per 1,000 gals.	.0034
Cost fuel oil and lubricants per 1,000 gals.	.0047

The results given above are not to be considered the best obtainable from the use of oil in pumping water, but represent the cost at the average pumping station. The use of low grade oils has proved to be practical and economical beyond all question. There are conditions where this type of pumping unit would not be satisfactory, particularly where a varying load is encountered. But where conditions are favorable, as in tank service, and the installation is ample in power, excellent results may be obtained, always provided the proper care is given the installation.

PROGRAM OF THE ROADMASTERS' ASSOCIATION CONVENTION.

The following program of business and entertainment has been prepared for the thirty-first annual convention of the Roadmasters' and Maintenance of Way Association, which is to be held in the Auditorium Hotel, Chicago, September 9-13.

TUESDAY, SEPTEMBER 9.

Morning.—Convention called to order at 10 a. m. by President William Shea.

Address of welcome on behalf of the city of Chicago by Mayor Carter H. Harrison.

Address of welcome on behalf of the railroads entering Chicago by W. H. Penfield, assistant chief engineer, Chicago, Milwaukee & St. Paul.

Reading of committee reports and general discussion.

Afternoon.—Reading of committee reports and general discussion.

WEDNESDAY, SEPTEMBER 10.

Morning.—Reading of committee reports and general discussion.

Afternoon.—Reading of committee reports and general discussion.

Automobile ride through the parks and boulevards of Chicago for the visiting ladies.

Evening.—Boat ride on steamer United States, leaving Clark street bridge at 6 p. m. Dinner will be served on board and there will be music for dancing. For roadmasters and guests and members of the Track Supply Association.

THURSDAY, SEPTEMBER 11.

Morning.—Election of officers.

Reading of committee reports and general discussion.

Adjourn at 1:30 p. m.

Afternoon.—Baseball game at 3:30 p. m., National League. Chicago vs. Brooklyn. For roadmasters and guests and members of the Track Supply Association.

Evening.—Theatre party for visiting ladies.

Second annual banquet given by the Track Supply Association in honor of the members and guests of the Roadmasters' and Maintenance of Way Association. The banquet will be given in

the Auditorium. The list of speakers will include: H. R. Safford, chief engineer, Grand Trunk; W. L. Park, vice-president, Illinois Central; W. A. Garrett, vice-president, Chicago Great Western; Paul Hamilton, engineer track and roadway, Cleveland, Cincinnati, Chicago & St. Louis; James Burke, superintendent roadway, B. & B., Erie, and C. E. Lindsay, division engineer, New York Central. Goldsmith's orchestra and the Oxford Quartette will furnish entertainment during the banquet.

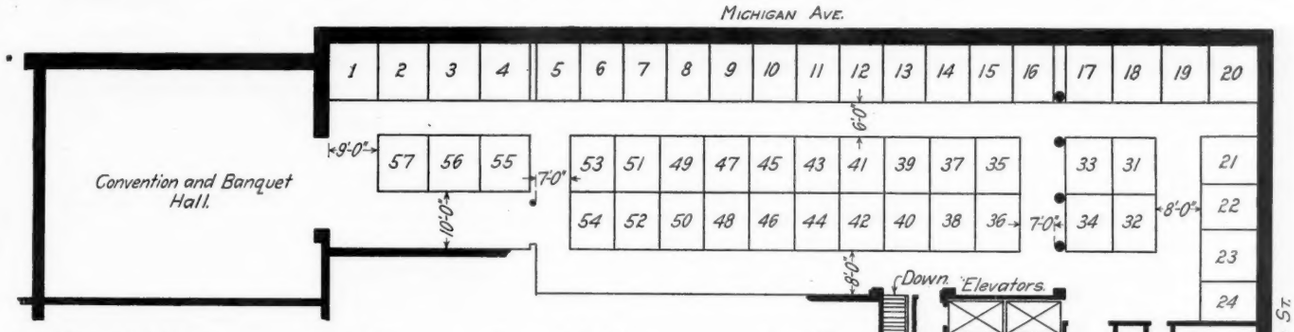
FRIDAY, SEPTEMBER 12.

Morning.—Reading of committee reports and general discussion.

Afternoon.—Reading of committee reports and general discussion.

The following committee reports will be discussed: "Contracting of Maintenance Work," "New and Improved Appliances," "Combined Organization of Maintenance Forces," "The Use of Power Driven and Labor Saving Appliances" and "Prevention of Accidents, Personal and Otherwise, Viewed from the Maintenance Standpoint."

In connection with the convention, the Track Supply Association will conduct an exhibition of track material and devices in the corridors on the ninth floor of the Auditorium Hotel adjoining the convention hall. The location and number of these exhibits is shown on the accompanying diagram.



Name of Exhibitor.	Booth No.
Ajax Forge Co.	10 and 11
American Guard Rail Fastener Co.	8
American Hoist & Derrick Co.	5
American Steel & Wire Co.	2
American Valve & Meter Co.	29 and 30
Associated Mfg.'s Co.	46 and 48
Barr, Jas. C.	34
Beaver Dam Malleable Iron Co.	54
Blessing, Louis	47
Carnegie Steel Co.	1
Chicago Pneumatic Tool Co.	25
Crerar Adams Co.	50
Elliott Frog & Switch Co.	22
Fairbanks-Morse Co.	31 and 32
Fairmont Mach. Co.	36 and 38
Haggard & Marcusson Co.	42
Hall Switch & Signal Co.	35
Hayes Track Appliance Co.	49
Hobart-Allfree & Co.	44
Hubbard & Co.	15
Indianapolis Frog & Switch Co.	45
Joyce Cridland Co.	52
Keystone Grinder Co.	16

Name of Exhibitor.	Booth No.
Lackawanna Steel Co.	20
Madden, P. H.	37
Mudge, Burton W., Co.	41 and 43
M. W. Supply Co.	7
National Lock Washer Co.	23
National Malleable Castings Co.	13
New York Steel Ry. Tie Co.	27
Northwestern Motor Co.	51 and 53
P. & M. Co.	17
Pennsylvania Steel Co.	19
Pocket List of Railroad Officials	56
Positive Rail Anchor Co.	39
Q. & C. Co.	6
Railroad Supply Co.	9
Railway Age Gazette	57
Railway List Co.	40
Rail Joint Co.	18
Ramapo Iron Works	21
Sellers Mfg. Co.	14
Southern Ry. Co.	3 and 4
Templeton Kenly Co.	12
The Track Supply Association Headquarters.	28
Verona Tool Works	33

Name of Exhibitor.	Booth No.
Whall, C. H., & Co.	—
Wharton, Wm., Jr., & Co., Inc.	24
Union Switch & Signal Co.	55
U. S. Wind Engine & Pump Co.	26

Plan of Track Exhibit at Roadmasters' Convention.

FRENCH RAILWAY IMPORTS.—The question of the origin of light railway rolling stock and material came up for discussion in the French senate a short time ago. The Minister of Public Works was asked whether the supply of this plant was reserved to French makers, and whether he would arrange for such a policy to be followed if that were not the case at present. Judging by the reply, French makers have nothing to fear in the matter. The minister said that he would not personally sanction an order going abroad unless there was a difference of at least 15 per cent. between the lowest French and the lowest foreign tender. This really means that the home makers have a protective tariff of thirty per cent., since there is an ad valorem duty of fifteen per cent. on imported material of the kind into France.

SPECIFICATIONS FOR MANGANESE STEEL RAILS.

Although manganese steel rails have been manufactured for five years or more, it is only within the last two or three years that they have been made commercially, those rolled during the first years being largely for experimental purposes. During the past two years manganese steel rails have been inserted on curves near the entrance of the new terminal of the Chicago & North Western at Chicago; the Lackawanna has placed 500 tons on curves carrying a heavy freight traffic and they have been installed in a number of other roads as well as on elevated roads and in subways. Because of the attention being given to manganese rail at the present time, the following specifications of the Manganese Steel Rail Co., New York, are of interest:

1. Chemical composition.—For all sections:

Carbon	0.95 to 1.35 per cent.
Phosphorus	Not over .10 per cent.
Manganese	10.50 to 15.00 per cent.

2. Quenching.—All rails shall be quenched in water bath within a period of a minute and twenty seconds after leaving the final pass. In case, on any occasion, this limit of time before quenching is exceeded, for any cause whatsoever, such rails shall be especially marked, and a bend test made from both ends of the bar. This bend test shall consist of taking a two-inch section of the finished rail and bending the head down towards the base, cold, under the steam hammer. In case this bend test from either end of the rail breaks, before the head has been bent through an angle of 90 deg., a further bend test shall be cut from the same end of the same rail and retested. If this retest breaks, the rail shall be retreated so as to stand all test specified herein.

3. Drop test.—The drop test shall be made on a piece of rail not less than four feet and not more than six feet long. These drop test pieces shall be selected, one from each pit in which the ingots are heated. These rails shall be placed head upward on the supports and the various sections shall be subjected to the following impact tests under a free falling weight:

Weight of rail per yard.	Height of drop in feet.
50 to 60 lbs.	17
61 to 70 lbs.	18
71 to 80 lbs.	18
81 to 90 lbs.	19
91 to 100 lbs.	20

If any rail breaks when subjected to less than three blows under the drop, two additional tests shall be made on the "A" rails from the same pit; if either of these retests fails all of the "A" rails from the pit which they represent shall be rejected. Two tests shall then be cut from the "B" rails from the same pit and if both of these tests meet the above requirements, all the remaining rails from that pit shall be accepted. If either of these "B" rails fails all the "B" rails from that pit shall be rejected. Then two tests shall be cut from the "C" rails and tested, and so on until all the rails from the pit have been tested.

The drop testing machine shall have a tup of 2,000 lbs. weight the striking face of which shall have a radius of not more than 5 in., and the test rails shall be placed head upwards on solid supports 3 ft. apart. The anvil block shall weight at least 20,000 lbs. and the supports shall be part of, or firmly secured to, the anvil. The report of the drop test shall state the atmospheric temperature at the time the test was made. The temperature of the test pieces, when tested, shall not be less than 60 deg. F., nor greater than 120 deg. F.

4. Section.—The section of the rail shall conform as accurately as possible to the templet furnished by the railroad company, consistent with clause No. 5 relative to the specified weight. An allowance in height of 1/64 in. under and 1/32 in. over and in width of 1/16 in. will be permitted. A perfect fit of the splice bars shall be maintained.

5. Weight.—The weight of the rails shall be maintained as nearly as possible, after complying with clause No. 4, to that specified in contract. Rails shall be accepted and paid for according to actual weights.

6. Length.—The standard length of rails shall be 30 or 32 ft. Ten per cent. of the entire order shall be accepted in shorter lengths, varying by even feet down to 24 feet. A variation of ¼ in. in length from that specified will be allowed.

7. Branding.—The name of the maker, the weight of the rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of the heat and the number of the pit in which the rails were heated shall be so stamped on each rail as not to be covered by the splice bars. A letter shall be stamped on the side of the web to indicate the portion of the ingot from which the rail was rolled.

8. Punching.—Circular holes for splice bars shall be punched in accordance with the specifications of purchaser. They shall in every respect accurately conform to drawing and dimensions furnished and shall be free from burrs.

9. Finishing.—The distance between the supports of rails in the gaging press shall not be less than 42 in. Rails shall be straight in line and surface when finished—the final straightening being done while cold—smooth on head, sawed square at ends, variations therefrom to be not more than 1/32 in., and prior to shipment shall have the burr caused by the saw cutting removed and the ends made clean.

10. Inspection.—The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times while his contract is being executed, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the rails are being made in accordance with the terms of the contract. All tests and inspections shall be made at the place of manufacture prior to shipment, and shall be so conducted as not to unnecessarily interfere with the operation of the mill. The manufacturer shall furnish the inspector with a complete analysis of every heat. Analyses shall be made on drillings taken from small test ingots, the drilling being taken at a distance of not less than ¼ in. beneath the surface of said test ingot. On the request of the inspector, the manufacturer shall furnish drillings for check analysis.

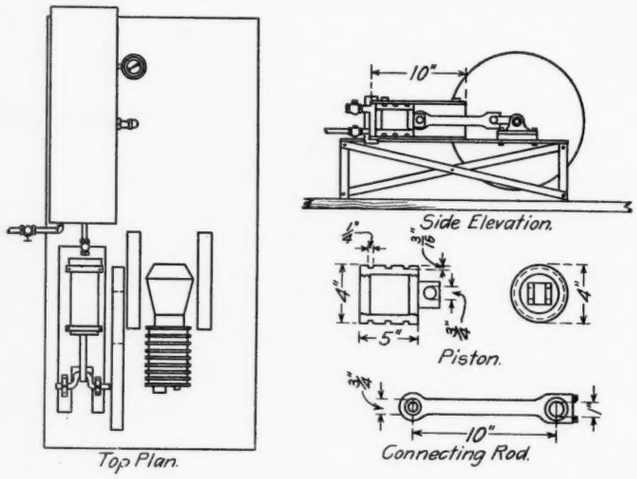
11. No. 2 Rails.—Rails, which by reason of surface imperfections, are not classed as No. 1 rails, shall be considered No. 2 rails; but No. 2 rails shall not be accepted for shipment which have flaws in the head of more than ¼ in., or in the flange of more than ½ in. in depth; and these shall not, in the judgment of the inspector, be, in any individual rail, so numerous, or of such a character, as to render it unfit for No. 2 rail uses.

12. Designation of No. 2 Rails and Short Lengths of No. 1 Rails.—Both ends of all No. 2 rails shall be painted white. Both ends of all short length No. 1 rails shall be painted green.

WHITEWASHING DEVICE WITH PORTABLE COMPRESSOR.

By F. W. Bentley, Jr.,
Machinist, C. & N. W., Milwaukee, Wis.

The practical utility of compressed air for applying paints and washes by the spray method is unquestioned where the supply of air can be maintained in quantity of flow and pressure to suit the requirements of the spraying device. The most serious drawback in connection with using the above method for whitewashing mileboards, crossing-posts, etc., lies in the difficulty of securing an efficient and inexpensive means for producing the compressed air.

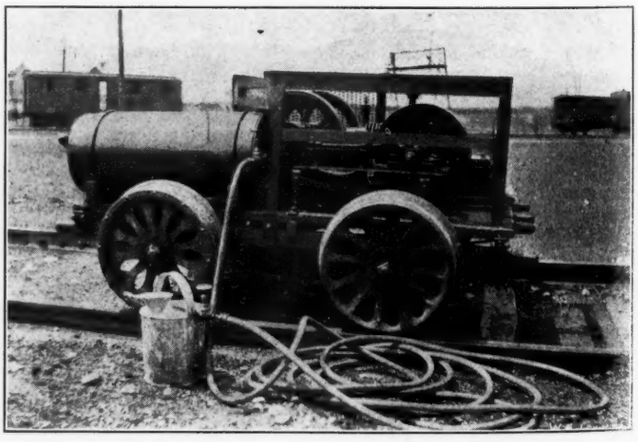


Details of Home-made Compressor.

The accompanying sketches and photographs illustrate a cheap, simple and efficient portable compressor, made out of odd fittings picked up in the shop and attached to a motor section car. The sketches were made by the writer from suggestions given for its construction by J. E. Tisdale, general foreman.

As the motor car to which the compressor is secured is self-propelling, the equipment is rapidly moved from one section to another with an attached trailer containing slacked lime solution.

The compressor cylinder is made from a piece of pipe bored to a diameter of 4 in. It is of the single stroke type having a



Compressor Plant on Motor Car for Spraying Whitewash.

½ in. discharge and a ¾ in. intake valve in the forged cap at the head end. The piston is made from an old rod bushing into each end of which old washout plugs are screwed three or four threads, giving the piston the advantage of lightness. The square head of the crank end plug was slotted out to take the rod pin of the back connection of the small 10 in. piston rod. A crank of 1 in. steel was forged with a 5 in. throw, being held in bearings as shown. An 18 in. pulley is placed on the other end of the shaft, being belted to a 6 in. pulley on the shaft of the car engine. The reservoir for storage is an old 14 in. x 33 in. drum taken from a scrapped engine, and is equipped with a gage and safety valve, which is set at 60 lbs.

With the above device it is possible to quickly raise and easily maintain any required pressure for operating the whitewash spray. The arrangement also greatly facilitates such work in-so-far as both labor and expense are concerned, for it is possible to simply turn it over to each consecutive section foreman as the work progresses.

TWO METHODS OF CALCULATING FROG ANGLES.

By F. W. Rizer,
Assistant Engineer, Chicago, Burlington & Quincy, Chicago.

In frog and switch calculations, where it is the practice to carry out the angles to hundredths or thousandths of a second, some perplexity occurs where a person using one method attempts to check calculations in which the other method was used.

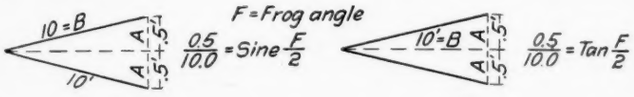


FIG. 1. FIG. 2.

The Sine and Tangent Methods of Measuring Frog Angles.

Figs. 1 and 2 show the two methods of calculating the angle of a No. 10 frog. The sine is used in Fig. 1 and the tangent in Fig. 2. Both of the above methods are correct from a mathematical standpoint and either may be used provided one or the other is formally adopted as standard. Some railways and frog manufacturers use the former method and others the latter.

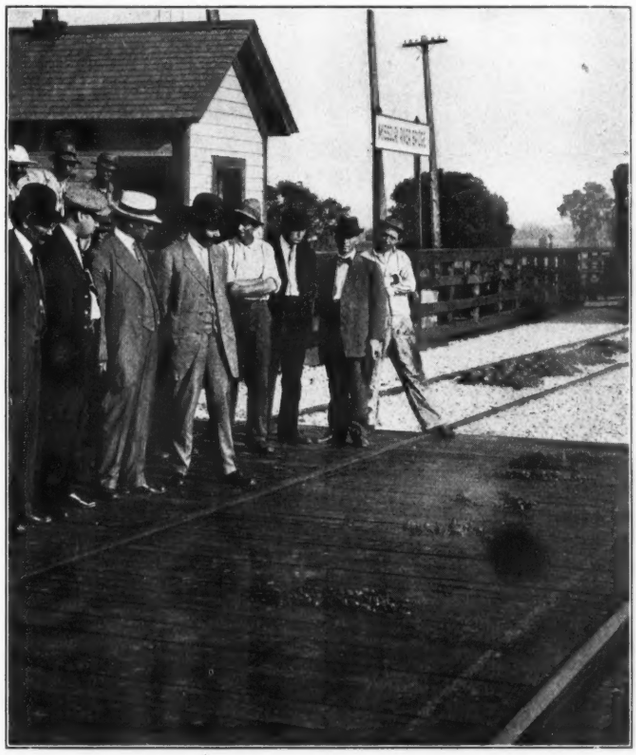
Most of the engineering field books, for some unknown reason, give the frog angles which are calculated as in Fig. 2, although that shown in Fig. 1 seems to be the more logical method since the definition of a 1 in 10 frog, for example, is a frog that spreads one foot in ten feet, and a person measuring a frog or laying out the angle will measure the distance along the rails and not on the line which bisects the angle.

Below is a table showing the frog angles, calculated by the two methods. The angles in the left hand column were calculated, as in Fig. 1, by the writer with a seven place table of functions and are correct to the nearest thousandth of a second. The angles in the right hand column were calculated as in Fig. 2 and are copied from Searles:

Spread of Frog.	$\frac{A}{B} = \text{Sine}\frac{F}{2}$	$\frac{A}{B} = \text{Tan.}\frac{F}{2}$
1 in 4	14 deg. 21 min. 41.436 sec.	14 deg. 15 min. 00 sec.
1 in 5	11 deg. 28 min. 42.024 sec.	11 deg. 25 min. 16 sec.
1 in 6	9 deg. 33 min. 37.378 sec.	9 deg. 31 min. 39 sec.
1 in 7	8 deg. 11 min. 31.520 sec.	8 deg. 10 min. 16 sec.
1 in 8	7 deg. 09 min. 59.916 sec.	7 deg. 09 min. 10 sec.
1 in 9	6 deg. 22 min. 10.121 sec.	6 deg. 21 min. 35 sec.
1 in 10	5 deg. 43 min. 55.084 sec.	5 deg. 43 min. 29 sec.
1 in 11	5 deg. 12 min. 37.809 sec.	5 deg. 12 min. 18 sec.
1 in 12	4 deg. 46 min. 33.714 sec.	4 deg. 46 min. 19 sec.
1 in 13	4 deg. 24 min. 30.435 sec.	
1 in 14	4 deg. 05 min. 36.336 sec.	
1 in 15	3 deg. 49 min. 13.534 sec.	
1 in 16	3 deg. 34 min. 53.649 sec.	
1 in 17	3 deg. 22 min. 14.974 sec.	
1 in 18	3 deg. 11 min. 00.630 sec.	
1 in 19	3 deg. 00 min. 57.295 sec.	
1 in 20	2 deg. 51 min. 54.314 sec.	

TESTS OF A FIRE RESISTING PAINT.

The protection of timber bridges from fire has received increased attention during the past two or three years. Among the various means adopted to protect structures against fires, paints have been frequently used. A number of tests have been made recently of the Clapp Fire Resisting paint, made by the



Burning Coals on Missouri River Bridge of the Illinois Central.

Clapp Fire Resisting Paint Company of Brookport, Conn., and as a result of these tests a number of roads are using this material regularly as a protection against fire.

On September 3, 1912, this paint was tested on the Missouri river bridge of the Illinois Central at Council Bluffs, Iowa. The floor of this bridge consists of a 3 in. plank deck on which one coat of this paint had been applied. The paint was put on at a boiling temperature so that it would penetrate the wood

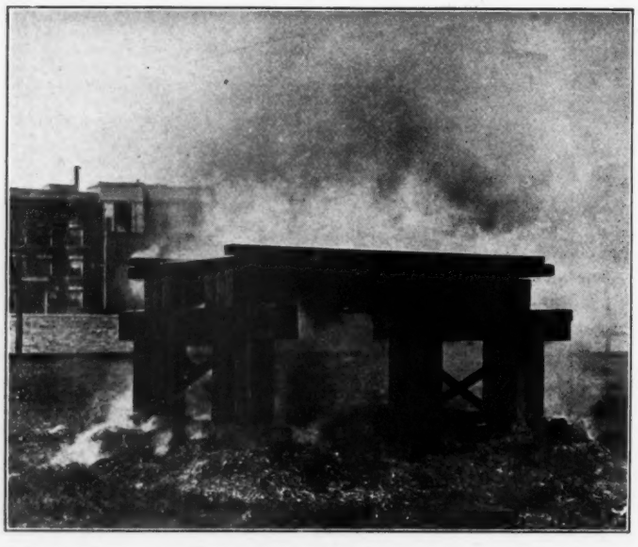
Result of Test on Missouri River Bridge, Showing Slight Charring of Wood.

quickly. After an interval of four weeks it was tested by placing live coals at five different places on the deck. These coals were taken from the firebox of a locomotive in a blazing condition and burned one hour and 10 min. before going out. After they went out an examination showed that the planking was only charred to a depth of 1⅜ in. and the fire had not spread from the original areas covered.

On the following day a test was made of a one span structure erected purposely for this test at Chicago. One coat of

Attempting to Burn a Section of Test Trestle at Chicago.

paint had been applied to this structure about three weeks previous to the test. Six large sacks of shavings, three bales of hay and one bale of straw were scattered under the structure and it was fired. After the fire was completely out an examination showed that the timbers were charred but very little. Although the stringers, ties and bents were a solid mass of flames shortly after the fire started, as soon as the paint began to come out of the wood it formed a hard crust which soon extinguished them.



Effect of Fire on Test Trestle at Chicago; Surface Charred Only.

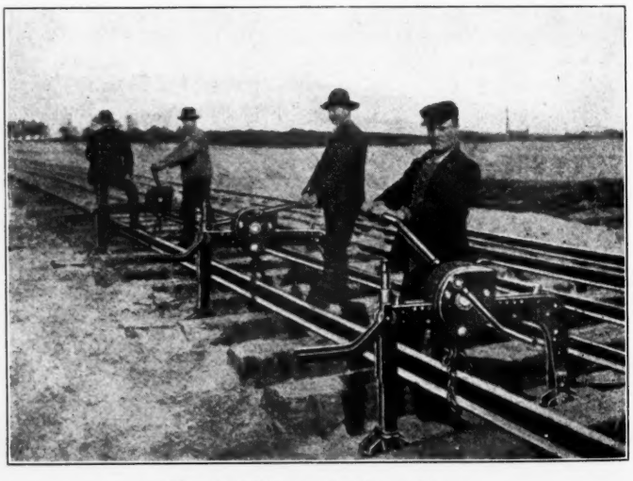
The Chicago Great Western tested the Clapp paint in July, 1911. Pile trestle bridge No. 341 near Stillman Valley, Ill., had been painted with this preparation, one gallon covering about 150 sq. ft. of surface. An engine was run across the trestle, which is 147 ft. long, dumping as many live coals as possible. There was no indication of fire starting. The engine was run across several times with the same result; then several shovels of burning coal were deposited on the ties and between the ties on top of the stringers. This coal was permitted to burn until the fire went out, no water being used to extinguish the fire, with the result that in each case a spot about 4 in. in diameter was charred to a depth of ½ in. to ¾ in. There was no indication, however, of the fire spreading. One of the coals dropped from the engine fell in a little pocket in one of the ties, which had probably been caused by a knot falling out. As this pocket had been well coated with paint the fire was immediately extinguished.

In addition to the fire resisting qualities of the paint, it was found in this case that it also acted to some degree as a preservative. The trestle on which the test was made was built in March, 1904, and it was expected to replace it during the present season. When an inspection was made of its condition early this spring it was found that it would be possible to let the old structure remain for at least one more year. The Clapp paint is standard for certain classes of structures on the Chicago Great Western, and a stock is kept in the store department for distribution as needed.

A TRACK SHIFTER.

When excavation is being carried on parallel to a track which is being used for construction purposes, the track must be shifted laterally from time to time, as the cut approaches it, and it is convenient to have some means of doing this work systematically and cheaply. The usual method of using "main force and crowbars," is expensive and slow.

A device intended to shift track easily and cheaply has been developed by the Maschinenfabrik Buckau of Magdeburg, Ger-



Track Shifters in Operation.

many. The machine which is shown in the illustration simultaneously raises the rails and shifts them laterally about 24 in.

A chain is passed under the rail and hooked to the device, and one man at each apparatus can do the entire work of shifting. The device weighs 280 lbs. The amount of lift and shift depends on the slope of the grounds, the arrangement of the chains, etc. The time required depends on the strength and skill of the men.

THE KILBOURNE & JACOBS AUTOMATIC AIR DUMP CAR.

A new side dump car which is unlocked, dumped, righted and relocked automatically by the application of air drawn from the air brake train line has been developed by the Kilbourne & Jacobs Manufacturing Co., Columbus, O. This car is dumped by a piston on one side and is righted by another piston on the opposite side, the operating devices for each side being

Side View of Kilbourne & Jacobs Car.

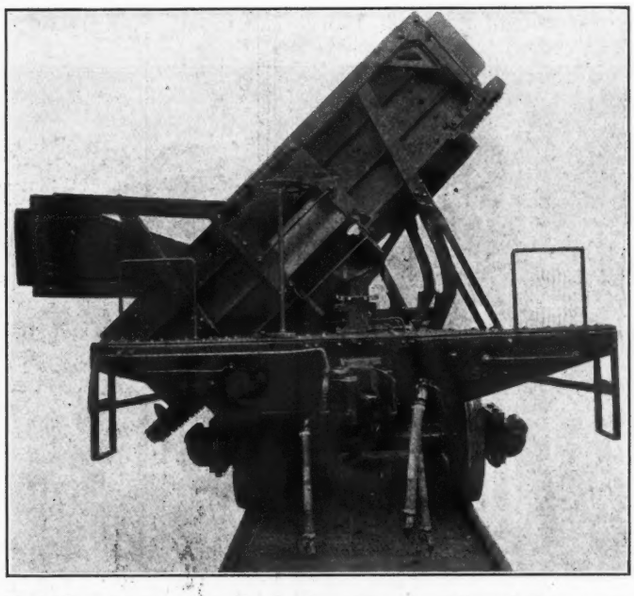
entirely separate and independent. The storage reservoirs are placed between the draft sills and are charged directly from the air brake train line.

The cars are designed to dump upon the high side of a curve as well as upon the low side. Trains can be dumped simultaneously to the right or left; alternate cars can be dumped on opposite sides, or any portion of the train can be dumped independently. They dump at an angle of 44 deg., throwing the material clear of the track and thus largely eliminating danger of derailment. The unlocking and relocking of cars is automatic and being locked in transit they cannot dump accidentally.

The car is constructed of steel throughout with the exception of the floor which is of hardwood. The doors are of steel box girder type and are suspended at the top from the lifting levers so that they are free to swing out when struck by the dumping load. The car conforms to the specifications of the Master Car Builders' Association and the Interstate Commerce Commission and is designed for use in freight trains at all ordinary speeds.

This type of car is built in three sizes. The 20 yd. "Range" type is designed for work on the main line and weighs approximately 47,800 lbs. with a length over couplers of 32 ft. and with a maximum capacity of 28 cu. yds. The "Contractors" type is lighter in construction with 16 cu. yds. capacity and a maximum load of 23 cu. yds. The third car, the 16 yd. "Range" type is designed for heavy service, especially in handling iron ore strippings.

These cars have been used on a number of systems including the Chicago, Burlington & Quincy, Chicago, Rock Island & Pacific, Louisville & Nashville, Great Northern, Pennsylvania Lines and Delaware, Lackawanna & Western. They are being used not only for grading work but for ballast cars and for handling cinders. One southern road has adapted this type of equipment to the handling of sugar beets. In one instance 26 16 yd. cars of this type carried an average load of 98,000 lbs. for 11 hours per day for seven months, hauling in this period 4,500,000



End View of Steel Air Dump Car, Showing Hinged Doors, etc.

cu. yds. of iron ore. These cars worked in temperatures falling at times as low as 22 deg. below zero, and the total repair bill for this time was $544.18, or $20.93 per car.

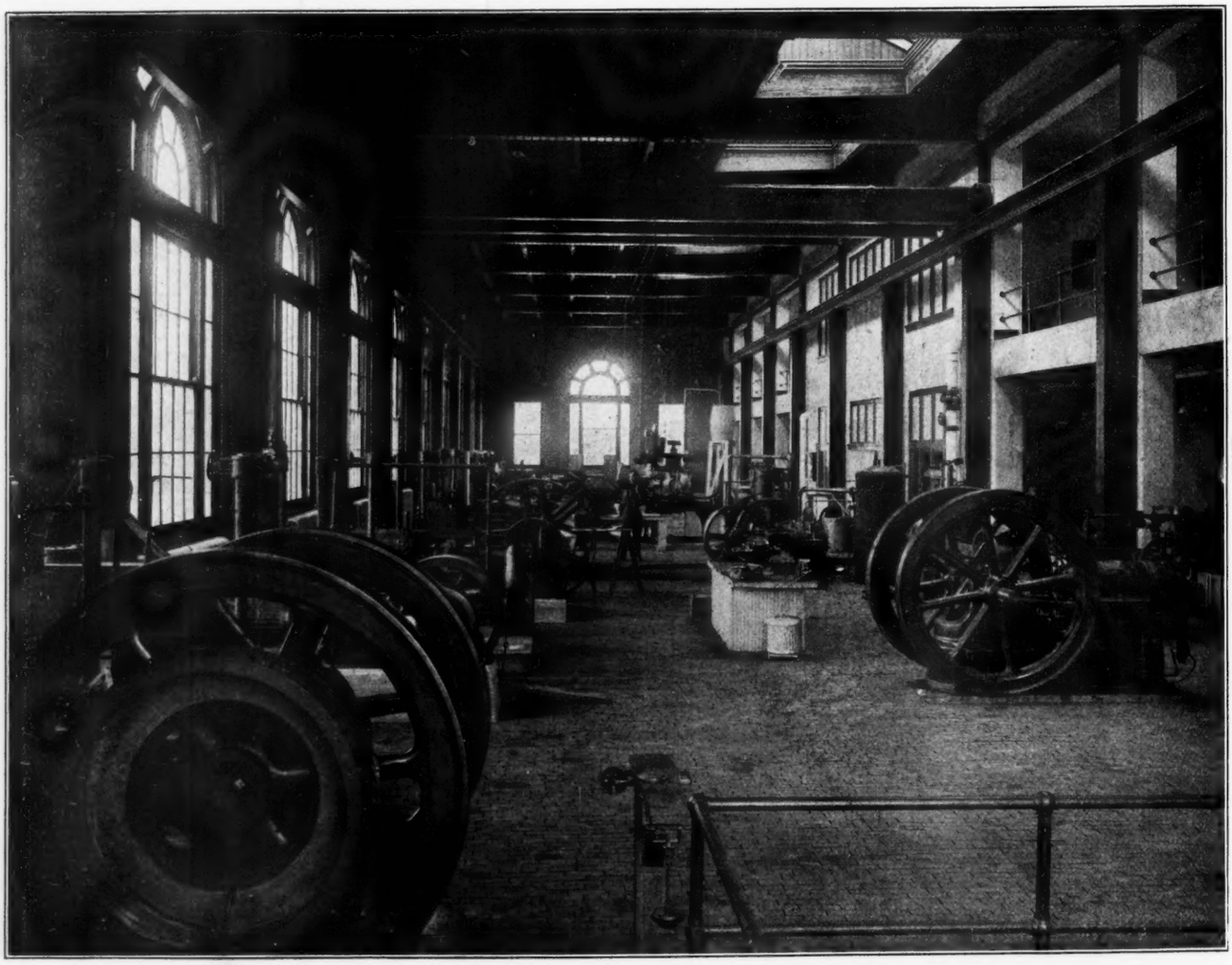
EXPERIMENTAL RAILROAD.—The Railroad Company of this city (Raleigh, N. C.) expect to have their road between the Capitol Square and the Stone Quarry completed by New Year's Day if not prevented by inclement weather, and a handsome car upon it for the accommodation of such ladies and gentlemen as may desire to take the exercise of a railroad airing.—*From a despatch dated December 28, 1832, to the American Railroad Journal.*

Under-side of Dump Cars, Showing Air Cylinders and Operating Mechanism.

UNIVERSITY OF CINCINNATI CO-OPERATIVE COURSE IN RAILWAY ENGINEERING.

The experiment of the University of Cincinnati in offering co-operative engineering courses received widespread attention at its inception and has been watched with interest by many educators and engineers. The possibility of training young men as railway engineers in a course which combines practical experience in various departments of railroad work and a thorough training in engineering principles is of particular interest to railway men. These courses have now been in existence long enough to indicate their success and to make a description of their operation interesting. The students in railway engineering university. The students are divided into pairs, alternating at work and in school, the period of alternation being two weeks. This arrangement has been found best for the students, and since one of the boys is always at work, the employer receives continuous service. The co-operative courses are offered in chemical engineering, civil engineering, electrical engineering, mechanical engineering and metallurgical engineering, railway engineering being considered as one of the branches of civil engineering.

The electrical engineering and mechanical engineering students were first tried on the co-operative plan. The logical place to start such students in practical work seemed to be in a foundry. Here they cut sand, help the molders, and feed the cupola with the other foundrymen, being transferred after a time to the ma-



General Laboratories at the University of Cincinnati, the Only Shop in the Institution.

are now being used on three divisions of the Pennsylvania Lines West and the Cleveland, Cincinnati, Chicago & St. Louis is employing them in track, signal and bridge gangs with very good satisfaction. The first test of these boys in railroad work was made on the Union Pacific, the accompanying photograph showing some of them engaged in handling rail in an ordinary section gang. On account of the distance from Cincinnati, however, the Union Pacific had to discontinue the use of these students.

The co-operative courses are based on the principles that by giving students theory and practice alternately, they will derive the greatest good from both and that the experience gained in working under actual industrial conditions is much more valuable than that acquired in a "practice shop" maintained by a chine shop and other departments of the plant where they work in much the same manner as an apprentice machinist, finally reaching the designing and engineering departments.

When the co-operative plan was extended to the civil engineering course, places could easily be found for the students in the city engineering department and with engineers and contractors on building and bridge construction. It was a much more difficult matter, however, to plan for a course of railroad work which would properly train a student to become a railway engineer. It was realized that positions on an engineering corps, which are usually the only ones open to engineering students or young graduates, do not give the boys the knowledge of maintenance and operation which a successful railway engineer needs, and it was therefore decided to start

them in an ordinary section gang. They are required to handle a pick and shovel at first, being given the same treatment and pay as other section hands. After a time, however, they get a chance to help make out the foreman's reports and may act as assistant foremen when they show the ability. From the section gang the boys go to a bridge carpenter gang, where they repair pile trestles, renew timber decks and handle minor repairs on buildings. Then they are placed in a signal construction gang where they may start by bonding rails or placing concrete foundations, being given a chance later to help install interlocking machines or maintain block signals. The length of time spent by a student in each of these three departments is approximately one year, although local conditions, the boy's previous experience and his rate of progress in the work may cause some changes in this schedule to be made.

As the railway course has only been operating for three years it cannot be said definitely what positions the boys will fill beyond those named. It is expected, however, to give them some knowledge of construction work, such as track elevation or yard construction, and some experience in the motive power department, probably at a division engine terminal where they can learn the general construction of cars and locomotives and acquire considerable operating knowledge. Arrangements have been made also to give them experience in a bridge shop, and

University of Cincinnati Co-operative Students in a Union Pacific Section Gang.

to place them with railroad contractors doing heavy construction.

One of the principal advantages of the co-operative system is that all practice shops can be eliminated from the university. At Cincinnati the only laboratory in the institution which in any way approaches the practice shops known in most engineering colleges is the general laboratory which is shown in one of the accompanying photographs. This is fitted up for testing work on all kinds of mechanical and electrical devices, and is used for some class work, and in large part for thesis work. Incidentally, the thesis work done by students in a co-operative course can be made much more valuable than the problems usually handled by senior engineering students. After working for five years in a shop or on a railroad, the student is more than likely to have come in touch with some definite problem which needs solution, and in several instances, manufacturers have co-operated with students in such thesis work by furnishing full sized machines and all equipment for the making of tests from which they were anxious to secure the benefits. The fact that no practice shops are needed means that a very large saving in expenditure for equipment can be made, and this saving when applied to the salaries of professors makes it possible to get the best men available.

Another of the advantages of the system as it is operated at Cincinnati is that a very careful selection of students is made. The capacity of the school is limited and the 285 students who were taking these courses last year were all that could be handled under present arrangements. Out of the total number of applicants for entrance, of which there are several thousand each year, the number of new students that can be accommodated, which is now 160, are selected after careful questioning and after making sure that the applicant fully understands what he wants to study and what will be expected of him in the co-operative course. These boys are required to start their practical work in July, and their admission to the university in the fall is in a measure dependent on the showing made during the summer. Most of those who lack the qualities required to carry out so strenuous a course as this are eliminated before school opens in the fall. Further elimination is made during the first year and readjustment as to course is often found advisable. In most engineering schools any boy who presents credentials of scholarship from a recognized preparatory school is accepted as a student and is allowed to pursue the course which he thinks he wants to take. Under the system at Cincinnati the professors have an excellent chance to determine from the boy's work both in the shop and the classroom whether he is adapted to the line of work he has entered and if not, they urge him to change as soon as possible. This system of selection results in the securing of young men who are not only good students, but who have in large measure the natural qualifications to become engineers.

The fact that the students receive regular rates for the work done makes it possible for many boys to take this course who would be unable to secure the money for a regular four year theoretical course. The amount of money paid to the boys is usually not sufficient to pay all of their expenses of board, lodging and tuition, but some of them have even been able to save money during the five years they were in the university. A minimum rate of $0.15 per hour for the first year, with an increase of $0.01 per hour for each succeeding year is fixed by an agreement between the university and the various companies for which the boys are working. The minimum scale on the Pennsylvania and the Big Four, where most of the boys in railway engineering are taken, is $0.165 per hour to start. The tuition is $50 a year, with the usual laboratory fees and text book expense.

An important feature of the system is the use of special instructors called "co-ordinators," who spend enough time with the boys at their work to keep in close touch with the problems that they are meeting there so that these problems may be explained and used in classroom work to illustrate principles which are being taught, thus definitely connecting in the student's mind his practice and theory.

Probably the best indication of the success of the co-operative courses is the showing made by the students and the satisfaction which is shown by their employers. There is at present a much greater demand for the co-operative students by industrial firms in and around Cincinnati than the university's facilities can accommodate. Agreements have been made by the university with about 65 corporations to take co-operative students and other companies that are waiting for a chance to get young men of this kind may be added to this number if plans now under consideration for offering somewhat more specialized courses to train boys for executive positions in industries not generally recognized as of an engineering nature are carried out. The ability of the co-operative students to handle important work is shown by the fact that two of the boys during last summer alternated as foreman of an important department of a big machine shop to allow the regular foreman to go home to Belgium for a vacation.

Another example of their ability was shown just after the

floods of last spring when a call for assistance was sent in by the town of Hamilton, Ohio, which had been very seriously damaged. The dean of the engineering college took 12 senior electrical students to Hamilton without much knowledge of what was needed, but with the intention to do the best they could to relieve the situation. It was found that the water supply of the town was cut off since this water was secured from deep wells driven by electric pumps and the local generating station had been so flooded that the motors and switchboard equipment were too badly damaged to operate. The boys took hold of this damaged plant, and in less than a week had overhauled the water-soaked motors, repaired the switchboards and were supplying water to the town.

During the emergency work which had to be done by the C. C. C. & St. L. after the same floods, two of these co-operative students proved themselves very valuable members of emergency gangs. One of these boys had enough knowledge of electrical engineering to install a temporary lighting plant at the site of a big bridge which had been washed out, making it possible for the night shifts to work to much better advantage.

Dean Herman Schneider, of the school of engineering of the University of Cincinnati, is responsible for the adoption of this experiment, and he feels that the results secured have justified his contentions in favor of the system.

MOTOR CAR TROUBLES, THEIR SYMPTOMS, CAUSES AND REMEDIES.

The Educational Bureau of the Union Pacific has recently issued a copyrighted instruction book on "Railroad Track Motor Cars," a copy of which has been supplied to practically every employee operating motor cars. The following notes are taken from this book:

A gasoline engine or a motor car usually behaves in one of the four following ways: It does not run at all. It runs nicely a short distance and then stops. It runs—explosions being quite regular, but the engine seems weak and does not develop power. It runs—explosions being irregular or infrequent; that is, the engine misses fire but apparently has plenty of power when explosions do occur.

Each of these symptoms indicates one or more specific causes as described in the following paragraphs:

If the motor car does not work, or does not operate properly, the trouble should be looked for and remedied as quickly as possible. If the operator does not know from the action of the engine the cause of the trouble, time may be saved by searching for it in a systematic manner. There may be no buzz at the vibrator; this may be due to one or more of the following causes: The battery switch may not be closed, or the throttle lever may not be in position to close the circuit. The primary wires may be loose at their connections. There may be a broken primary wire or a poor connection to the binding post between the battery and the spark coil; between the spark coil and the timer; or between the battery and the ground connection on the throttle-lever quadrant or the engine frame; or dirt may be interfering with the proper contact at the timer. If the primary wires are all right, then the vibrator spring may need adjusting or the contact points need cleaning. Adjustment of the spring can be accomplished by operating the thumb screw provided, and the contact points may be cleaned by passing a strip of paper between them while the vibrator is gently pressed down. If the vibrator will not operate after the above remedies have been applied, the indications are that the battery is too weak.

If there is a buzz but no explosion, some one or more of the following suggestions may aid in finding the cause: The cock in the gasoline pipe may be closed. Endeavor to get an explosion by priming the cylinder with a thimbleful of gasoline. If an explosion does not follow, a grounded secondary wire or a poor connection to the binding post between the spark coil and the spark plug should be looked for.

If the secondary wire is found in proper condition, the battery switch should be opened to prevent the operator from receiving a shock from the battery; and the spark plug should be removed by unscrewing. Then lay the spark plug on the cylinder head so that the rod in the center of the plug will not be in contact with the cylinder head; close the battery switch and push the car until a buzz is obtained at the spark coil. If under these conditions no spark is obtained at the spark plug, the insulated rod in its center should be cleaned; following which, if there is still no spark produced, the spark plug should be taken apart and cleaned, or a new spark plug should be substituted for the one removed.

RUNS FOR A SHORT DISTANCE.

If the car runs nicely for a short distance and then stops, the most frequent cause of trouble is interference with the proper supply of gasoline. The operator may have neglected to open the cock between the gasoline tank and the carbureter—the car stopping as soon as the limited supply of gasoline in the carbureter is used up. There may be dirt or an obstruction of some other kind in the gasoline pipe, which prevents the free flow of gasoline to the carbureter. There may be water in the gasoline, which is carried over from the carbureter and collects on the spark-plug points, forming a bridge through which the current can pass without creating the desired spark in the cylinder. The batteries may be weak, having only sufficient strength to supply current for a few explosions.

Weak explosions may be due to some one or more of the following causes: The fuel mixture may be too "rich." This will be indicated by smoke or yellow flame passing from the exhaust pipe or muffler. The needle valve should be closed tight, the throttle opened and the car pushed 200 or 300 feet to clear the cylinders of gas. Then the needle valve can be opened a part of a turn and another start made. The needle valve may have been opened too far before starting the engine. The fuel mixture may be too "weak." This will be indicated by the odor of the exhaust or by back-firing with a two-cycle engine. In such a case the needle valve should be opened a part of a turn or more. The muffler may be clogged, preventing free escape of all of the burned fuel. In such a case the muffler should be taken off and cleaned.

If there are few and irregular explosions, the trouble may be due to some of the following: The cylinder inlet valve may not work. The car should be pushed and the valve watched to see whether it is stuck; and if so, it should be opened several times by hand until it works properly. If only a few explosions occur after priming the cylinder the carbureter should be primed again and the needle valve opened part of a turn. The primary or secondary wires may be grounded on account of poor insulation, particularly the secondary wires, in which case there will be a continuous buzzing when the switch is closed, irrespective of the position of the timer. Investigate to see whether the secondary wires are securely tightened in the binding posts.

The needle valve may require opening a few turns on account of a partial clogging of the valve through an encrustation or deposit on the valve stem. Experiment by closing the needle valve and then fully opening it, because the passage way may be clogged with sediment from the gasoline. Sometimes if the car is pushed along the track about 100 feet the dirt will be sucked out of the needle valve. The suction should be tested by placing the hand over the air-intake opening of the carbureter while the car is moving. If this suction is found to be weak, the air-intake valve should be opened about three-quarters of the length of the screw, because the suction may be insufficient to pull the gasoline through the needle valve of the carbureter, and into the cylinder through the cylinder inlet valve. Weak suction may indicate that the intake valve is stuck shut, or that the exhaust valve is stuck open, or that the throttle valve of the carbureter may be partly or completely closed. If when the car is moved air is blown outward through the carbureter, instead of being sucked in, it indicates that the inlet valve is stuck open, or in case this valve is mechanically operated, it indicates that the cam

shaft or intake cam is out of position, resulting in the improper timing or opening of this valve. Inexperienced men driving cars that have chain-driven cam shafts have much trouble from cam shafts and cams being out of position.

Take off the top cover of the carbureter and see that the valve works freely, and whether gasoline runs freely into the cup when the float is depressed. Gasoline leaking from around the top of the carbureter (flooding) indicates dirt in the float valve, or that the float is stuck down. It is a common practice when it is thought that there is dirt in the needle valve to screw the valve tight and open it again. This practice almost always results in embedding hard foreign substances permanently in the nozzle. In Schebler carbureters it is better to take the top cover off the carbureter and insert a small common pin into the nozzle where it opens into the mixing chamber. This should be done before drawing off the gasoline as foreign substances will then be dislodged and can be drawn off by draining the carbureter. Try closing the cock in the pipe which leads from the gasoline tank to the carbureter. Then unscrew the plug at the bottom of the carbureter, drawing the gasoline into a cup. If there is any water or dirt in the float chamber of the carbureter or the gasoline pipe, it will be drawn off in this manner. The plug may then be replaced, the gasoline cock opened, and the carbureter primed for another trial. Finally, if only a few explosions occur after priming the cylinder and testing for the trouble in the foregoing manner, it is necessary to clean the needle valve of the carbureter. This may be done by closing the cock in the gasoline pipe, unscrewing the needle valve and very gently pushing a piece of wire into the needle-valve opening with such care as not to injure the nozzle. This will free the valve of any obstruction.

Misfiring is another cause of trouble, and may be due to one or more of the following conditions: The primary wire should be inspected to see whether it is broken or loose at any of its connections, because this will stop the buzz of the spark coil if the broken ends are separated or shaken apart due to the vibration of the car. The secondary wire should be inspected because it may have become loosened or grounded as a result of the vibration of the car. The buzzer of the spark coil may not be properly adjusted or it may be sticking either up or down so that the buzz is not continuous. In such a case the vibrator screw should be adjusted and the contact points cleaned. The timer contacts may be rough, or the stationary part of the timer may be loose. In such a case the contacts may be smoothed by means of fine sandpaper, or the timer tightened. The spark plug may be dirty and should be cleaned. To do this the battery switch should be opened, the spark plug unscrewed, and taken apart if necessary so that the end of the plug and the insulated rod can be cleaned; and then the plug tested by laying it on the cylinder, and pushing the car as already explained. Weak batteries may be the cause of misfiring because a spark may not be given continuously at the spark plug. The batteries may be only polarized and will perhaps work again if they are not used for half an hour. In an emergency, cut a hole in the top of each cell and pour in two teaspoonfuls of water. This may cause the battery to give enough current to carry the car a few miles.

Back firing is another trouble; it may have its source in one or more of the following causes: If the engine back fires through the carbureter, the inlet valve to the cylinder may be stuck open or may be broken. In the former case it should be operated by hand until it opens and closes properly. The timer may be loose or so improperly set that the spark occurs late in the explosion stroke of the piston. This will permit the inlet valve to open before the previous charge has been burned, particularly in two-cycle engines where the exhaust of one charge and the intake of the next occur at practically the same time. The timer may be loose or so improperly set that the spark occurs too early in the compression stroke, thus causing the engine to run backwards. Carbon deposits on the cylinder walls or piston may become so hot as to cause the explosion to occur too early in the compression stroke, or the cylinders may become heated to such a degree as to cause the explosion too early in the compression stroke.

HANDLING SECOND HAND RAILS AND FASTENINGS ON BRANCH LINES.

By P. H. Hamilton,

St. Louis & San Francisco, Neodesha, Kan.

Several railroads have elaborate systems for sorting out, cutting off and rerolling rails released from main lines for use on branch lines; but on most roads it is customary to ship released rails direct from the point of release to the place where they are to be relaid. In many instances the foreman loading the released rail cares little about the trouble or expense he may cause the man who is to relay it.

Where released rails are being shipped to another division for immediate relaying, the man in charge of the shipping should see that the rails are loaded so that they require the least handling at their destination, and to prevent delays to the rail gang. Rails should be loaded from both sides of the car, and the foreman in charge of the unloading should see that they are unloaded from the same side they came up on. By examining the ball of the rail the man on top of the car can tell which side they should be rolled off on, and can eliminate the necessity of the tong men turning the rails. If possible, rails of only one length should be loaded on a car, all short rails being loaded separately. This will enable the gang laying the rails to keep the joints properly "broken," and the short rails can be used around switches, crossings, etc. It is a costly proposition for a foreman to keep 10 or 12 men ahead of the rail gang matching up rails because the party loading the rails has given no attention to this detail.

When unloading rail the foreman should be furnished with a list of the material on each car so that he can arrange to dispose of the short rails, or battered and curve worn rails with the minimum amount of handling. It should not be necessary to unload a lot of short pieces out on the line and then have to pick them up with a work train. Frogs and switch material should not be loaded on the same car with rails. If it is necessary to unload rail and sort it out, this should be done in yards, and the cars should be "spotted" so that there will be no charge for train service. However, the proper time to sort rail is as it is being picked up along the track.

It is preferable to use new joints on relaying rail to make good track, but it is often necessary to use the joints released with the rail. In case second hand joints are to be used they should be loaded on the cars with the rails. When the rail is to be laid immediately after distribution, and new joints are to be used, the joints should be distributed with the rail, to save train service and to get the proper distribution. When the joints are received ahead of the rails they should be piled at a station in a convenient place for reloading, and be reloaded and distributed with the rail.

In loading rails by hand the unison-man should always stand on top of the car. He should be provided with a rail fork, and in addition to "bawling out" he should line the rails up after they are thrown on the car and see that each rail lies straight with the car. If the car is properly loaded, and the rails lie straight the load will not shift endwise, and bulkheads will not be necessary for short hauls.

Much valuable time is wasted in applying rusty bolts and rusty joints, and for this reason it is important that all track material be kept as free from rust as possible. If possible, all small material should be unloaded out of the weather, and should be distributed only a short time before it is to be used. Guard rails, switch rods, and other track fixtures are generally shipped out to the work with all the bolts and nuts in place. When they are first received, the bolts and nuts are greasy, but a few days in the weather soon rusts them so that when placing a guard rail or a switch rod, it costs more to remove the nuts from the bolts than it does to apply the fixture.

Track spikes and track bolts should not be kept where they are exposed to the weather, and rail joints should be kept off the ground until they are to be applied. Rusty track spikes are

harder to drive, and are more apt to "fly," causing personal injuries. Rusty track bolts and rail joints are hard to apply, and they increase the cost of maintenance of tight joints. It is hard to make a rusty joint fit up against the rail properly. We always oil the continuous joints where they fit against the base of the rail, which cuts the rust and allows the joint to get a good bearing against the base of the rail. A barrel of crude petroleum oil will grease the joints on about five miles of track.

The foreman in charge of the rail gang should have an extra box car in which to carry his supply of bolts, spikes and small material. He should replenish this supply at the various stations when necessary, and should take out with him from camp each day only what he will need that day. This insures his having good material to work with, saves the time of men running back and forth along the track looking for material, and no new material is left behind.

Trackmen dislike using rusty second hand spikes, on account of their being hard to drive. When a large supply of second hand spikes is accumulated the foreman should throw them on a pile of old ties and burn them. The expansion from the heat removes the rust, and makes them much easier to drive.

SCALE SHOPS.*

The size and requirements of a shop to repair scales only are not as extensive in character and detail as for one for their manufacture. The machinery need not generally be as extensive and elaborate, especially when the scale shop is located near other shops, where much of the machine work may be economically performed. However, the apparatus for testing, sealing and gaging is not essentially different in a manufacturing and a repair shop. The following requirements in the layout of a scale shop, with the necessary machinery, testing apparatus, etc., are suggested for a shop adapted both for manufacture and repair.

The ideal scale shop should be self-contained, consisting of an independent or separate building located on the ground floor, well lighted and ventilated in such a manner as to provide materially against air currents, which interfere with the proper sealing of levers. Independent foundations should be provided for all the machinery, to eliminate vibratory conditions as far as possible.

By way of suggestion, at least, for some of the larger railroads, it has been found that a suitable shop for both manufacturing and repairs, requires a floor area of about 7,500 sq. ft., an outside storage space of probably 70 ft. x 20 ft. for storing and the assembling of scales, structural steel, etc., and another outside space 100 ft. x 60 ft. for the storage of miscellaneous parts and castings. If it is not desired to fabricate and assemble the steel bridges in the shop, additional space may be required on the outside of the building for this purpose.

The shop should be served by an overhead traveling crane of 30 tons capacity, the crane runway being extended outside the building over the storage space. Two tracks should enter the building, one leading to the master scale, which should be located in one corner of the building, where the travel in and out of the shop will not be great. The track leading to this scale should be used only for running on to the scale the test weight cars and other materials to be weighed. The other track should enter the building for a distance of two car-lengths, for the handling of material.

The following tool equipment is suggested for consideration, the size and kind to be determined by the requirements: One screw-cutting engine lathe, one turret lathe, one plain milling machine, one universal milling machine, one rack gear cutter for graduating and notching beams, one heavy shaper, one middle-sized shaper, one heavy radial drill, one upright drill press, one sensitive drill press, one plain grinder with double-end spindle for two emery wheels with top platen for grinding face contacts on pivots, one disk grinder with tilting feed table, one buffing wheel, one bolt cutter and one universal shop saw.

Work-benches should be provided for the required number of men, with vises spaced not closer than 8 ft. apart, all vises to have compensating jaws, with swivel bases.

The following are suggested standards to properly equip a scale shop: One master scale to have a capacity of at least 100,000 lbs., sensitive to within the smallest graduation on the beam and to be of good design and workmanship. It should be located in one corner of the scale shop, under the direct supervision of the foreman, and built on an independent foundation, close to the entrance to the shop, to afford easy access for the test cars; one even arm master sealer's balance, with a capacity of not less than 50 lbs. and preferably 100 lbs. in each pan, with a sensibility of over two grains; one sealer's balance, having a capacity of 2 lbs. in each pan, with a sensibility of 1/10 grain; and a sufficient number of sealing beams, preferably with a multiple of 10 to 1, for all kinds of levers, as may be required. The more modern method of sealing is to use a compound beam, specially constructed for the purpose. In connection with this outfit there should be provided such trestles, horses, and other devices as may be necessary to suspend the various types of levers and beams to be sealed.

There should also be one set of Tobin bronze master weights ranging from 50 lbs. to 1/16 ounce and of "Class A" standard as provided by the United States Government Bureau of Standards, Washington, D. C., to be used as primary standards; one set of decimal grain weights, ranging from 10 grains to 1/1000 grain, or an equal quantity of accurately sealed weights of other denominations; five 500-lb., two 1,000-lb. and one thousand 50-lb. test weights, for testing the master scale, the values to be derived from the primary standards, with a permissible tolerance of 25 grains, either in excess or deficiency. These weights can be carried in cars used for road work, when desired. When this is done, however, they should be maintained to within 100 grains of their true value.

The equipment should also include one laying-off or surface table, of suitable size to meet requirements; a full assortment of micrometer gages for measuring pivot distances; also range bars or special straight edges for determining the range of pivots in beams or levers; one specially constructed overhead structure, for sealing trussed-levers and dormant scales; one heating furnace of suitable size, preferably gas. There may, of course, be additional apparatus and equipment needed to specifically meet all other requirements, but this can readily be determined as the organization is developed.

When the scale shop is located in close proximity to a car and locomotive shop, the forgings, pivots, etc., should for economical reasons be made in the regular blacksmith shop. The pivot work, however, should be done by men regularly assigned to this work, who should be thoroughly familiar with the requirements and with the best methods of heating and tempering. This will result in a great saving of work in the scale shop, such as fitting pivots in repair work, etc. The heating, forging, and tempering of pivots should be done in a special furnace equipped with a pyrometer to get the best possible results. Some of the scale shop machinery may be eliminated if practical and economical to perform the necessary work in a regular machine shop. It is also assumed that the necessary carpenter work can be done in the regular department for that work; also that the painting can be taken care of in the same way, as these parts of the work are of limited quantity and ordinarily would not be of sufficient volume to keep even a few men continually employed.

The men employed in the manufacture and repair of scales in the shop should be those who understand to some extent the theory, as well as the construction, of scales. A competent foreman should be employed, and he should select capable machinists with a conception for such work, who in a short time under proper schooling should be able to fill the requirements.

*Abstract of a report presented to the American Railway Association at New York, May 21, 1913.

General News.

The fifteenth annual convention of the Southern Railway Agents' Association was held at Atlanta, Ga., August 6, 7 and 8. Officers were re-elected for the ensuing year as follows: C. G. Walker, Louisville, president; C. E. Coffey, East St. Louis, vice-president; W. J. Townsend, Augusta, secretary, and J. M. Bryan, Columbia, treasurer.

A motor car on the Central New England, carrying track laborers, ran into a freight train near Pleasant Valley, N. Y., on Friday last and two men were killed and two injured. Both the car and the freight train were running at good speed at an obscure place in the road; and the result was a violent butting collision, completely wrecking the motor car.

The recent decision of the Court of Claims in favor of the Chicago & Alton, holding that the post office department had not been justified in calculating the average weight of mails by counting seven days in a week, appears to have been thus far without result. The collection of the judgment by the Alton depends on an appropriation by Congress; and in dealings with other roads the post office department continues the practice which was condemned by the court.

The Canadian Northern, on recommendation of its safety committees, has issued a bulletin to shippers, station agents and trainmen announcing that in order to check the growing and dangerous tendency to increased loading heights of logs and lumber the extreme height of load to be permitted hereafter will be 15 ft. above the top of the rail. Stakes may be extended 2 ft. higher. Agents and conductors will refuse to accept loads not in conformity with these rules.

The Canadian Brotherhood of Railway Employees has received from the general manager of the government railways a letter to the effect that the employees of the Intercolonial will be granted increases of pay dating from March last. It appears that some of these increases have already been announced, but that further action will be taken in order to put all classes of employees on a basis of equality. It is said that about two thousand persons will be affected and that the gross increase will be about $120,000 yearly.

C. M. Wood, flying in a monoplane, attempted, last Friday, to go from New York to Washington without landing, but he was compelled by trouble with his motor to alight at Gaithersburg, Md., 18 miles short of Washington. He started from Hempstead, L. I., about 4:30 a. m., and traversed the distance of about 287 miles in four hours, thirty-one minutes. He followed the Pennsylvania Railroad, and had a special train on that road to serve as a guide, but he flew at great height and the railroad was out of his sight nearly all of the time.

Senator Lea of Tennessee has introduced in Congress a resolution calling upon the Interstate Commerce Commission to investigate the relations of the Louisville & Nashville to certain of its subsidiary lines. The senator explains that there is a fear in Tennessee that the Louisville & Nashville will absorb the Tennessee Central and bring the entire state under the domination of the L. & N. The resolution calls on the commission to see what money the L. & N. has spent for maintaining political agents, for furthering political campaigns, or for the prevention of the construction of other railroads.

The Interstate Commerce Commission has ordered all common carrier telephone companies to furnish by October 1 a detailed statement of their organization and equipment and physical and financial operations. This is the first important order of the commission in relation to telephones. The commission has made an extensive inquiry, special agents of the commission having gathered a large quantity of data bearing upon the operation of telephone companies. As soon as practicable the commission will hold in various parts of the country public hearings concerning the rates and operating methods of such companies as come within the jurisdiction of the commission.

W. B. Spaulding, chairman, Central Safety Committee, St. Louis & San Francisco, reports that for the 12 months ending June 30, 1913, as compared with the same 12 months prior to the inauguration of the Safety First work on the Frisco, there were 18 less trainmen killed, or a reduction of 62 per cent.; 413 less trainmen injured, a reduction of 35 per cent.; one less switchman killed, a reduction of 17 per cent.; and 13 less switchman injured, a reduction of 5 per cent. This makes a total of 445 less casualties to trainmen and switchmen. Mr. Spaulding holds that these reductions were unquestionably effected by the activity of the committeemen and other employees interested in personal injury prevention work. The record discloses that in every instance on any division where there was considerable activity in looking out for and quickly repairing defects in appliances on cars which trainmen and switchmen had to use, there immediately followed a radical reduction in the number of casualties to trainmen and switchmen.

The general safety committee of the Baltimore & Ohio has issued to employees a bulletin announcing that the number of fatal injuries happening to employees on the road during the month of July, is the lowest since the records have been kept—that is, for over two years. But three employees were fatally injured, and one of these was off duty. In all three of the cases the victim stood on or entered the track immediately in front of a train, with his eyes open and apparently in possession of all his senses. The lesson of all three was simply that we should form the habit of looking in both directions before stepping on a running track. The president of the road, Daniel Willard, writing in the *Baltimore & Ohio Employees' Magazine* for July, thanks the officers and employees of the company for what they have done in support of the policy of "Safety First," and appeals to every employee to make still further efforts to promote safety. Employees are requested to report, either by interview or by letter, everything which may indicate a dangerous condition; and by way of providing against every possible cause for reluctance, Mr. Willard says that facts in this field may be sent direct to him by letter; and such letters will be treated as confidential if the writer so desires.

A copy service department has been established by the Union Switch & Signal Company, Swissvale, Pa., and a bulletin has been issued telling of its uses. It is intended for the benefit of railroad companies which may wish to use information about their signals as features of their time tables or other advertising matter. A road on which the Union signals are in service may have the benefit of this new bureau without charge, not only for folders and such like documents, but also in the preparation of "news stories," or anything which may be intended to attract the attention of the public. It pays a road, says this bulletin, to advertise the fact that it is operated under the automatic block system. People have grasped the fact that automatic block signals are promoters of safety. The bureau will translate technical language into words that will be comprehended by the public, and at the same time will be characterized by accuracy. With the resources of the bureau no railroad advertising department need make the mistake (which has been made more than once) of showing signals wrong side up or wrong side out, or so arranged as to lead trains into danger. It is suggested that souvenir post cards may be filled with such good advertising that they can be sold for money.

New Station at Westerly.

The New York, New Haven & Hartford has just finished extensive improvements at Westerly, R. I., including a new passenger station, freight yard and freight house, and the elevation of the main tracks. A sharp curve has been taken out and a number of grade crossings eliminated. The cost of the crossing changes was borne in part by the city of Westerly. The passenger station is 123 ft. x 49 ft. and the platforms are 750 ft. long. The freight house is 250 ft. x 50 ft. and the freight yard has 8 tracks.

Railway Theatricals Up-to-Date.

Predetermined collisions of locomotives, which were quite fashionable a few years ago, have not been heard of for a long time; but the idea is not dead, and now it is to be perpetuated in moving pictures. According to the New York *World* a butting collision was "pulled off" in fine style, on the Raritan River Railroad, near South River, N. J., August 3, at the expense of the Vitagraph Company of America; and there were on hand the proper quota of actors and actresses to impersonate the

people who were killed, injured or distressed by the collision. The man who managed the camera escaped, by only three feet, a heavy piece of the locomotive which was thrown off, and struck the ground near him. After the preliminary scene had been gone through with, a car was set afire and the actors, substituting for themselves dummies where necessary, made a "rescue" scene. When the imaginary excitement was over the company of actors, said to be two hundred, sat down under the trees and partook of beer and sandwiches. The cost of this "act" is said to have been $35,000.

Condition vs. Theory.

While northwestern Oklahoma is not the only part of the state that is suffering for additional transportation facilities, that section of the state probably needs more steel rails than does any other locality of Oklahoma.

When the people of the northwestern part of the state, a vast empire, larger than several New England states, use their best efforts to secure the repeal of section 9 of article ix of the state constitution, they will have taken the first step toward getting more railroads for the convenience of the people who now are forced to haul grain and merchandise over long and rough roads.

If there had been no article ix, section 9, C. G. Jones would have built a road from Oklahoma City to the northwestern part of the state. Mr. Jones built three railroads, and at the time of his death two years ago he was contemplating the construction of other lines, awaiting only the repeal of the prohibitive section of the constitution. After borrowing $5,000,000, which he used to build railroads in Oklahoma, Mr. Jones found that the financiers refused to supply more funds to construct railroads that were prohibited by our constitution from being sold or leased to other lines.

At the time that the constitution was adopted, there was a sentiment which favored these restrictions. But we have seen that this section is a barrier and blocks development. It is time to stop fooling ourselves and to show that we are as progressive as we claim to be. It is time to repeal section 9 of article ix.—*Daily Oklahoman.*

The Public Makes No Demands.

Secretary Elliott of the International Travel Club has done well to call attention to the fact that when several railways lengthened the running time of their exceptionally fast trains they received only commendation from that public to whose insistent and compelling demand the putting on of such trains has so often been ascribed. Travelers do, indeed, prefer fast to slow trains, but they assume that the managers of railways know at what rate danger begins, and that they will not exceed or even approach it closely. The public influences speeds only by its willingness to take the faster of the trains which the companies in their competitions with each other see fit to provide. An article in this month's *Atlantic* on the lesson of the *Titanic* is marred by a like mistake as to the "demands" of travelers by sea. The writer blames the public for the magnificence and luxury of the enormous vessels now provided. But the public assumes that when they add Roman baths and gymnasiums and restaurants of stately expanse and gorgeous decoration to the simpler equipments of other days the ship owners keep the ultimate desideratum, safety, constantly in mind. Of course, we landsmen accept luxury gladly enough when it is offered to us and we can afford it, but the only real demand for the luxuries comes through stockholders hungry for dividends and from officers eager to draw traffic from other lines.—*New York Times.*

An Automatic (?) Speed Control.

The recent distressing series of fatal accidents on Long Island shows clearly enough the need of removing or guarding grade crossings. The remedy, of course, is to remove the crossings wherever that can be done, but when all the money which can be raised for this purpose has been spent there will still remain hundreds of grade crossings. Caution, however, is the one quality which drivers of fast cars seem determined not to use. To meet that emergency a man in Mount Vernon comes forward in the New York *Times* with a simple plan which would compel caution on the part of the very people least disposed to exercise it. Instead of a straight road he would build a square block in the center of the highway, which would compel vehicles to turn a right angle to the right before crossing and another turn afterward to get back into the main highway. No sober driver of a car would try to take these four sharp corners at high speed; and when he has slowed down he can hear and see a train if one is approaching. Undoubtedly speed maniacs will protest volubly at any regulation which compels them to go slow, but the automobile clubs ought to welcome this provision. The cost would be trifling and the block crossings could easily be set up in rural neighborhoods where there is no money to lower the grade of the highway.—*Brooklyn (N. Y.) Eagle.*

Exhibitors at the Traveling Engineers' Convention.

Among the exhibitors at the convention of the Traveling Engineers' Association, held at the Hotel Sherman, Chicago, August 12-15, were the following:

American Arch Company, New York, N. Y. Represented by W. L. Allison, J. T. Anthony, F. G. Boomer, G. O. Denney, C. E. Miller, J. P. Neff, LeGrand Parish, K. Tate and Geo. Wagstaff.

American Locomotive Company, New York, N. Y.—Photographs and literature. Represented by C. A. Delaney, A. M. Sheffer, W. J. Becker, F. V. Kennedy and W. P. Steele.

American Steel Foundries, Chicago, Ill.—Simplex couplers, Vulcan brake beam, economy draft arm, Vulcan truck, Andrews side frame and Simplex bolster. Represented by W. G. Wallace, W. A. Wallace and F. A. Lorenz, Jr.

Ashton Valve Company, The, Boston, Mass.—Boston and Chicago air gages, appliances and safety valves. Represented by J. F. Gettrust and C. B. Foster.

Barco Brass & Joint Company, Chicago, Ill.—Flexible joints, engine, tender, steam and air connections. Represented by F. N. Baird.

Bettendorf Company, The, Davenport, Iowa.—Model underframe and truck. Represented by J. G. Hope.

Brown & Co., Tom, Chicago, Ill.—Lovejoy expanders, jacks and tools. Represented by Tom Brown and Harry W. Stannard.

Chicago Car Heating Company, Chicago, Ill.—Heating appliances. Represented by J. E. Buker and E. E. Smith.

Commercial Acetylene Railway Light & Signal Company, New York, N. Y.—Acetylene headlights and signal lights. Represented by H. G. Doran.

Crane Company, Chicago, Ill.—Valves and fittings. Represented by Frank D. Fenn, G. S. Turner and F. W. Venton.

Dearborn Chemical Company, Chicago, Ill. Represented by J. F. Franey, C. S. Murray, W. S. Reid, I. H. Bowen, C. B. Hennessey, J. D. Purcell and J. F. Roddy.

Detroit Lubricator Company, Detroit, Mich.—Detroit lubricators. Represented by A. D. Homard and R. H. Lindman.

Dickerson Manufacturing & Supply Company, Clinton, Ill.—Water gages. Represented by C. L. Dickerson and F. H. Hinckley.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Graphite productions Represented by H. C. Sorenson, L. H. Snyder and F. R. Brandon.

Emery Pneumatic Lubricator Company, St. Louis, Mo.—Emery brake cylinder lubricant and automatic lubricators for pneumatic devices. Represented by H. C. Millar and E. A. Emery.

Equipment Improvement Company, New York, N. Y.—Markel devices and Wine side bearings for cars and tenders. Represented by W. E. Weatherly.

Franklin Railway Supply Company, New York, N. Y.—Franklin fire door. Represented by W. L. Allison, R. G. Coburn, W. H. Coyle, Jos. Sinkler and Hall R. Stafford.

Galena Signal Oil Company, Franklin, Pa. Represented by W. E. Brumble, J. A. Rossevelt, Fred Smith, M. Meehan, J. A. Linahan, G. E. McVicker, Bloss Carey, Joe Arn, E. N. Sedwick, P. H. Stack, L. H. Palmer, W. J. Walsh, Dan Enbanks and Wm. Holmer.

Gold Car Heating & Lighting Company, New York, N. Y.—Locomotive reducing valves, latest improved wedge locked steam hose couplings and temperature controls. Represented by W. H. Stocks and A. D. Stuver.

Greene, Tweed & Company, New York, N. Y.—Palmetto packing and Favorite reversible ratchet wrench. Represented by A. J. Richardson and L. J. Van De Wall.

Hammett, H. G., Troy, N. Y.—Radius grinder and Trojan metallic packing. Represented by E. C. Sawyer.

Hunt-Spiller Manufacturing Corporation, Boston, Mass.—Gun iron for locomotive castings. Represented by J. G. Platt, V. W. Ellet and J. M. Monroe.

Jenkins Bros., New York, N. Y.—Valves and packing. Represented by B. J. Neely.

Jerguson Manufacturing Company, The, Boston, Mass.—Wiltbonco water gages. Represented by H. M. Waters.

Jerome-Edwards Metallic Packing Company, Chicago, Ill.—Packing. Represented by L. E. Bulter and George C. Jerome.

Johns-Manville Company, H. W., New York, N. Y.—Armored squirt hose and packing. Represented by D. L. Jennings.

Keystone Lubricating Company, Philadelphia, Pa.—Keystone driving box.

Leslie Company, The, Lyndhurst, N. J. Represented by J. J. Cizek and S. Inglis Leslie.

Liberty Manufacturing Company, Pittsburgh, Pa.—Boiler tube and locomotive arch tube cleaners. Represented by S. A. Bockius and Chas. C. Hughes.

Locomotive Stoker Company, New York, N. Y.—Represented by F. H. Phillrick.

Locomotive Superheater Company, New York, N. Y. Represented by C. W. Wickham, John Bell, Geo. L. Bourne, Geo. Fogg, B. G. Lynch, R. M. Ostermann, F. E. Schaff, W. G. Tawse, G. E. Ryder, G. E.

Spengler, Wm. Boughton, W. A. Buckber, C. D. Hilferty, A. C. McLachlan and R. R. Porterfield.

McCord & Company, Chicago, Ill.—Locomotive force feed lubricator. Represented by R. L. McIntosh, L. H. Neal, W. J. Schlocks, H. S. Whitehair and H. E. Creer.

Manning, Maxwell & Moore, Inc., New York, N. Y.—Valves, gages and inspirators. Represented by J. H. Bush, C. L. Brown, F. R. Smith and F. J. Wilson.

Mark Manufacturing Company, Chicago, Ill.—Cold drawn steel unions. Represented by M. K. Kimberly and J. V. Larson.

Moon Manufacturing Company, Chicago, Ill.—Headlights. Represented by H. E. Procunier and F. E. Hutchison.

Mudge & Company, Chicago, Ill.—Mudge-Slater spark arrester. Represented by B. W. Mudge, G. W. Bender, Robt. D. Sinclair and Robt. M. Smith.

Nathan Manufacturing Company, Chicago, Ill.—Steam boiler supplies. Represented by J. C. Currie, J. S. Suley and A. S. Work.

National Boiler Washing Company, Chicago, Ill.—Photographs and descriptions. Represented by E. B. White.

National Graphite Lubricator Company, The, Scranton, Pa.—Graphite lubricators. Represented by L. S. Watres and D. J. Lewis.

National Railway Devices Company, Chicago, Ill.—Shoemaker fire door. Represented by Jay G. Robinson.

National Tube Company, Pittsburgh, Pa.—Kewanee specialties, N. T. C. regrinding valves and National pipe. Represented by B. F. Bart and L. R. Phillips.

Ohio Injector Company, The, Chicago.—Injectors, lubricators and flange oilers. Represented by A. C. Beckwith, Frank W. Furry, Wm. S. Furry, F. W. Edwards and F. B. Wipperman.

Okadee Company, The.—Blow-off cocks, water glasses and water hose couplings. Represented by A. G. Hollingshead and H. L. Winslow.

O'Malley-Beare Valve Company, Chicago, Ill.—Multiplate valves. Represented by Edward O'Malley and Thos. O'Malley.

Parkesburg Iron Company, Parkesburg, Pa.—Charcoal iron boiler tubes. Represented by J. H. Smythe, J. A. Kinkead and L. P. Mercer.

Parsons Engineering Company, Wilmington, Del.—Photographs showing elimination of smoke from locomotives and details of the equipment. Represented by Wm. H. Savery and John H. Parsons.

Paxton-Mitchell Company, Omaha, Neb.—Piston rod and packing. Represented by W. M. Leighton.

Pilliod Company, The, Swanton, Ohio.—Miniature locomotive operating with the Baker gear. Represented by R. G. Graham, Fred E. Pilliod and F. S. Wilcoxan.

Pyle-National Electric Headlight Company, Chicago, Ill. Represented by E. B. Barris, W. T. Bretherton, J. W. Johnson, J. E. Kilker, R. L. Kilker, E. E. Kirran, G. H. Matthews, C. P. McGinnis and Wm. Miller.

Standard Heat & Ventilation Company, New York, N. Y.—Heating and ventilating equipment. Represented by Wm. C. Hermsen, E. C. Post and A. L. Whipple.

Storrs Mica Company, Owego, N. Y.—Mica headlights. Represented by Tom Brown, Harry W. Stannard and Chas. P. Storrs.

Strong, Carlisle & Hammond Company, Cleveland, Ohio.—Randall graphite sheet lubricator. Represented by H. P. Prescott and B. E. Carpenter.

Syracuse Faucet & Valve Company, The, Syracuse, N. Y.—Syracuse valves. Represented by Jos. F. Brightman and S. B. Groner.

The New York Air Brake Company, New York, N. Y. Represented by B. Hyanes, Geo. Kleifges, M. LaQuay, Robt. G. Parker and Wm. Owens.

United States Metallic Packing Company, Philadelphia, Pa.—Packing, indestructable oil cups and sanders. Represented by M. B. Brewster, H. M. Wey and C. L. Mellor.

Universal Flexible Packing Company, Pittsburgh, Pa.—Air pump packing. Represented by John E. Chisholm.

Watson-Stillman Company, The, New York, N. Y.—Chambers throttle valve. Represented by Frank H. Clark and G. R. Smith.

Federation of Trade Press Association.

The annual convention of the Federation of Trade Press Associations will be held at the Hotel Astor, New York, September 18-20. The subject of the opening meeting on the morning of September 18 will be Business Promotion Through Trade Press Efficiency, which will be followed by addresses by President H. M. Wilson of the New York Trade Press Association, President H. M. Swetland, of the Federation of Trade Press Associations, Secretary-Treasurer E. C. Johnston, of the same association, and by the presidents of the various local associations. R. R. Shuman, of the Shuman-Booth Company, Chicago, will deliver an address on The New Force in Business, which will be followed by an address on The Weakest Spot in Trade Press Efficiency by Elton J. Buckley, editor of *The Grocery World and General Merchant.*

Lunch will be served at the Thirty-ninth Street Publishers' building, followed by an inspection of the plant and publishing offices of the Federal Printing Company. The editorial symposium, under the leadership of A. I. Findley, of the *Iron Age,* will be held on the afternoon of September 18. At this symposium will be presented papers on general editorial subjects; also on the relations of editors with other departments.

On the same afternoon there will be the circulation symposium under the leadership of M. C. Robbins, at which papers will be presented from subscription managers, canvassers, and subscribers, giving views as to the value of the trade press and wherein it fails to be of value to them.

On September 19 there will be the advertising symposium, which will be under the leadership of Hugh M. Wilson, and at which papers will be presented by educators, publishers, advertisers, advertising managers and advertising agents.

At the business meeting will be told the inside stories of some of the big trade paper publishing successes. These speakers will treat the fundamental principles upon which each business was built. H. M. Swetland, president, will preside.

In the afternoon there will be a mass meeting at which there will be a number of addresses by representative men on subjects of live interest to editors, publishers, and advertisers. The banquet will be held on the evening of September 19 at the Hotel Astor. John Clyde Oswald, of the *American Printer,* will be toastmaster. The speakers will include the Hon. Albert S. Burleson, postmaster general; The Hon. William C. Redfield, secretary of the Department of Commerce; John Kendrick Bangs; Tom Daly; the Hon. Charles F. Moore and Dr. N. M. Waters.

The publishers' symposium will be held on the morning of September 20. Here will be discussed the policies, standards, and ideals of the trade paper publishing business. This symposium will be under the leadership of E. R. Shaw, of *The Practical Engineer.*

William H. Ukers, 79 Wall street, New York City, is chairman of the committee on arrangements.

International Engineering Congress.

Col. George W. Goethals, chairman of the Isthmian Canal Commission and chief engineer of the Panama Canal, has accepted the honorary presidency of the International Engineering Congress, and will preside over the general sessions to be held in San Francisco, Cal., September 20-25, 1915.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July August and September, St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago.

International Railway General Foremen's Association.—Wm. Hall, 829 West Broadway, Winona, Minn.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

Maintenance of Way & Master Painters' Association of the United States and Canada.—W. G. Wilson, Lehigh Valley, Easton, Pa.

Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago.

Master Car and Locomotive Painters' Assoc. of U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

National Railway Appliance Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railroad Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

Railway Fire Protection Association.—C. B. Edwards, Mobile & Ohio, Mobile, Ala. Next meeting, October 7, Chicago.

Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo.

Railway Development Association.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Convention, October 14, Nashville, Tenn.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Railway Supply Manufacturers' Assoc.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

Railway Tel. and Tel. Appliance Assoc.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Signal Appliance Association.—F. W. Edmonds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago. Annual meeting, September 23-25, Chicago.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Track Supply Association.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—W. H. Wharton, La Salle Hotel, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

Utah Society of Engineers.—Fred D. Ulmer, Oregon Short Line, Salt Lake City, Utah; 3d Friday of each month, except July and August.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Erie Railroad reports that it has transported during the past ten years 303,580,752 passengers without loss of life or limb.

The Southern Railway is planning to exhibit southern farm products at three expositions and at thirty-five district or county fairs in northern and western states within the next few months.

Sailings of steamships from Galveston for foreign ports with wheat average more than one a day. The number of vessels scheduled to sail in the month of August is 49, besides 25 coasting vessels.

The Maine Central announces that 500-mile tickets, price $10, have been put on sale at all stations in New Hampshire, complying with a law of that state, passed at the last session of the legislature.

The movement of freight over the middle division of the Pennsylvania Railroad for the month of July is reported as the heaviest in the history of the road. The number of cars passing Denholm was 180,113, an increase of about 10,000 cars over the best previous record.

The Pennsylvania Railroad announces that with a view to making it more convenient for passengers to redeem unused tickets, agents have been instructed that if a ticket wholly unused is presented by the original purchaser at the ticket office at which it was sold, it may be redeemed for the fare at which it was sold.

The Louisville & Nashville on August 12 put into effect new passenger tariffs throughout the state of Alabama, based on a uniform rate of 2½ cents a mile. The order of the State Railroad Commission requiring the adoption of this rate was taken before the Federal Court last week with a view to making an appeal to the United States Supreme Court; but the judges decided against the company, and, apparently, the purpose to appeal has been dropped. This road has fought the low passenger rates in the State and Federal courts since 1906.

The Chicago & Alton has announced that its passenger trains will no longer stop at East St. Louis, but through trains between Chicago and St. Louis will be run over the Merchants' bridge, the east end of which is at Granite City. When the road abandoned the East St. Louis station some time ago protest was made to the Illinois Railroad and Warehouse Commission, and the company agreed to give service between Granite City and East St. Louis for one month on trial, and to continue the service if it proved profitable or even paid expenses. The test showed that but few passengers took advantage of the trains, and the commission has now given its permission to discontinue the service entirely.

The Eastern railroads are actively engaged in preparations to file freight tariffs showing the 5 per cent. increase heretofore spoken of; but there is no basis for the assertion that the roads are trying to force the commission to early action. After the application of the railroads for the advance the commission ordered an investigation of the whole matter on its own initiative. This disposition of the matter was entirely satisfactory to the railroads, but two of the members of the commission in a minority report held that the commission could not properly go into the matter unless actual tariffs had been printed and filed and were before the commission in evidence. In view of the objection raised by these two members, the railroads concluded to go ahead with the preparation of new tariffs.

The Department of Agriculture reports the general crop conditions on August 1 averaged for the United States 6.2 per cent. lower than on the same date last year, and 4.3 per cent. lower than the average condition on August 1 of recent years. The weather conditions about August 1 were unfavorable for the crops in general. Hot and dry weather has continued in Kansas, Missouri and neighboring states. The lowest conditions are found in Kansas with 31.6 per cent. below; Oklahoma, 18.0 per cent.; Kentucky, 13.6 per cent.; California, 12.8 per cent.; Illinois, 12.3 per cent., and Maryland with 12.2 per cent. below average conditions. The highest conditions are in Wisconsin

with 7.6 per cent.; Washington, 5.3 per cent.; Florida, 5.2 per cent., and Minnesota, 4.3 per cent. above the average conditions on August 1. The dry and hot weather throughout the southwest, which continued for 10 days without intermission, and caused much scarcity of water, was believed to have more than offset the effect of beneficial rains this week over Illinois, Nebraska, and Iowa. The Cincinnati *Price Current* estimates that 400,000,000 bus. of the growing corn have been destroyed by the drouth. The Chicago expert, Snow, assigned 300,000,000 bus. as the loss in June alone. Corn at Chicago, August 13, was quoted at the highest prices of the season; 73 cents a bushel for September, 68⅛ for December, and 69½ for May.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads, of the American Railway Association, in presenting statistical bulletin No. 149, giving a summary of car surpluses and shortages by groups from April 25, 1912, to August 1, 1913, says: The total surplus on August 1, 1913, was 69,716 cars; on July 15, 1913, 76,280 cars; and on August 1, 1912, 65,904 cars. Compared with the preceding period; there is a decrease in the total surplus of 6,564 cars, of which 2,438 is in box, 433 in flat, 4,393 in coal, and an increase of 700 in miscellaneous car surplus. The decrease in box car surplus is in all groups except, 1 (New England lines), and 11 (Canadian lines). The decrease in flat car surplus is in groups 1 (as above), 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The decrease in coal car surplus is in all groups, except 1 (as above). The increase in miscellaneous car surplus, is in groups 1 (as above), 2 (New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6, 7, 8 and 11 (as above).

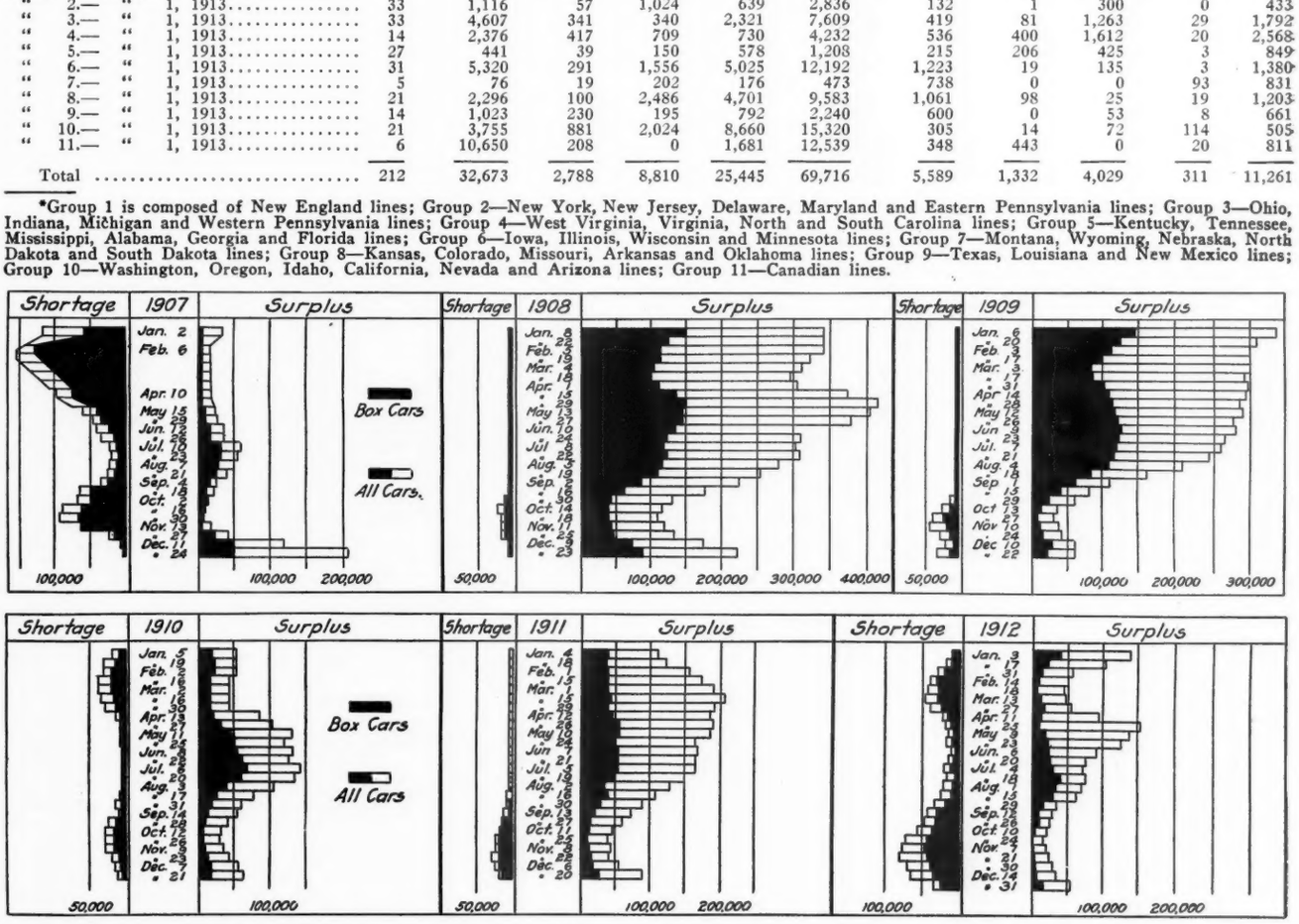
The total shortage on August 1, 1913, was 11,261 cars; on July 15, 1913, 6,875 cars; and on August 1, 1912, 9,394 cars. Compared with the preceding period; there is an increase in the total shortage of 4,386 cars, of which 2,428 is in box, 411 in flat, 2,203 in coal, and a decrease of 656 in miscellaneous car shortage. The increase in box car shortage is in all groups, except 2 and 5 (as above). The increase in flat car shortage is in groups 1, 2, 3 (as above), 4 (the Virginias and Carolinas), 8 and 11 (as above). The increase in coal car shortage is in all groups, except 8 and 10 (as above). The decrease in miscellaneous car shortage is in groups 1, 3, 6, 10 and 11 (as above).

Compared with the same date of 1912; there is an increase in

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—August 1, 1913	7	1,013	205	124	142	1,484	12	70	144	2	228
" 2.— " 1, 1913	33	1,116	57	1,024	639	2,836	132	1	300	0	433
" 3.— " 1, 1913	33	4,607	341	340	2,321	7,609	419	81	1,263	29	1,792
" 4.— " 1, 1913	14	2,376	417	709	730	4,232	536	400	1,612	20	2,568
" 5.— " 1, 1913	27	441	39	150	578	1,208	215	206	425	3	849
" 6.— " 1, 1913	31	5,320	291	1,556	5,025	12,192	1,223	19	135	3	1,380
" 7.— " 1, 1913	5	76	19	202	176	473	738	0	0	93	831
" 8.— " 1, 1913	21	2,296	100	2,486	4,701	9,583	1,061	98	25	19	1,203
" 9.— " 1, 1913	14	1,023	230	195	792	2,240	600	0	53	8	661
" 10.— " 1, 1913	21	3,755	881	2,024	8,660	15,320	305	14	72	114	505
" 11.— " 1, 1913	6	10,650	208	0	1,681	12,539	348	443	0	20	811
Total	212	32,673	2,788	8,810	25,445	69,716	5,589	1,332	4,029	311	11,261

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907-1913.

the total surplus of 3,812 cars, of which 4,639 is in box, 644 in flat, 1,683 in miscellaneous, and a decrease of 3,154 in coal car shortage. There is an increase in the total shortage of 1,867 cars, of which 1,392 is in box, 1,250 in coal, 138 in miscellaneous, and a decrease of 913 in flat car shortage.

The table on page 305 gives car surplus and shortage figures by groups for the last period covered in the report and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

Car Location.

The table on page 307, which is taken from bulletin No. 8-A of the American Railway Association, gives a summary of freight car location by groups on July 15, 1913.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads, of the American Railway Association, in presenting statistical bulletin No. 150, covering car balances and performances for April, says:

The miles per car per day, for April were 24.0, compared with 23.7 in March. This figure for April, 1912, was 23.3.

Ton miles per car per day, for April were 369, compared with 374 in March. This figure for April, 1912, was 340.

The proportion of home cars on line increased one point to 54 per cent. in April, 1913, compared with 53 per cent. in April, 1912.

The per cent. of loaded mileage for April decreased 0.6 per cent., to 69.4 per cent. This figure for April, 1912, was 69.1 per cent.

The average earnings per car per day for all cars on line were $2.48, compared with $2.47 in March. This figure for April, 1912, was $2.34.

The table on this page gives the car balance and performance in the month covered by the report, and the diagram on page 307 shows car earnings and car mileage and different car performance figures monthly from July, 1907.

Manufacturers' Railway and the Interstate Commerce Commission.

The Manufacturers' Railway, St. Louis, announces that it will continue to operate its road notwithstanding that under the recent decision of the Interstate Commerce Commission (*Railway Age Gazette*, August 8, p. 247), it is unlawful for the trunk lines to continue the former allowances. The road will appeal to the courts, as no formal order was made. The opinion of the commission is declared by the officers of the road to be paradoxical. While permitting the Manufacturers' Railway to retain its status as a common carrier, at the same time it imposed conditions which are declared to be impossible. The road now receives a maximum of $4.50 per car. The commission held that it was entitled to only $2, but at the same time ruled that the trunk lines could not absorb even that small amount; that it should be charged in addition to the full rate to and from St. Louis. George F. Moore, president of the road, declaring that the new rate would put the Manufacturers' line out of business, has filed a protest with the commission. "The Manufacturers' Railroad could not live a day under the rates suggested by the commission's opinion," said Mr. Moore. "We cannot even receive car demurrage from the trunk lines. As each car is on our tracks about four days that means we receive only $2 a car and have to pay out about the same sum for car rent. The Terminal Railroad Association receives about $6 for each car it handles. The new rates have not been promulgated by an order of the commission. Until they are so promulgated we will continue to do business as at present. If an order fixing the $2 rate is issued we will go into court and ask an injunction against its enforcement."

INTERSTATE COMMERCE COMMISSION.

Complaint Dismissed.

National Lumber Exporters' Association v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Prouty:

The commission decided that the rate of 15 cents per 100 lbs. for the transportation of hardwood lumber from Pine Bluff and

CAR BALANCE AND PERFORMANCE IN APRIL, 1913.

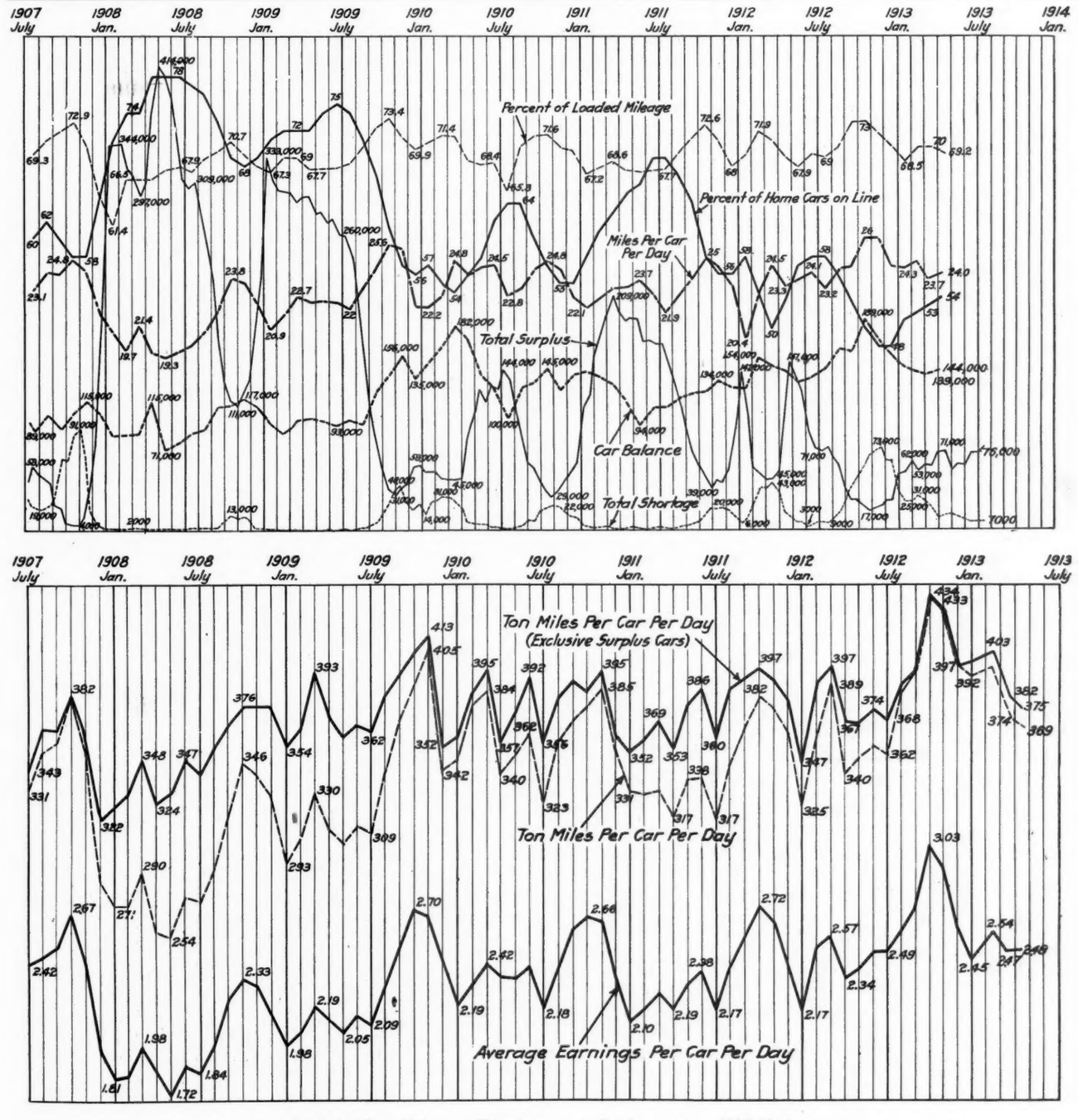
	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	89,771	687,841	220,708	188,875	171,261	423,999	18,526	144,413	31,365	136,064	134,732	2,247,555
Average number of system cars on line	42,698	353,489	122,316	100,468	77,405	278,653	5,858	71,236	19,441	65,946	87,393	1,224,903
Railway-owned cars: Average foreign on line	54,069	307,222	119,370	88,650	81,221	149,963	10,689	63,571	22,544	48,274	52,764	998,337
Total Railway-owned cars on line	96,767	660,711	241,686	189,118	158,626	428,616	16,547	134,807	41,985	114,220	140,157	2,223,240
Excess	6,996	*27,130	20,978	243	*12,635	4,617	*1,979	*9,606	10,620	*21,844	5,425	*24,315
Per cent. of cars on line to total owned:												
Home	48	51	55	53	45	66	31	49	62	48	65	54
Foreign	60	45	54	47	48	35	58	40	72	36	39	45
All railways	108	96	109	100	93	101	89	89	134	84	104	99
Private cars on line	3,500	35,777	10,254	6,598	10,196	14,218	1,662	7,246	4,295	9,698	3,241	106,685
Total, all cars on line	100,267	696,488	251,940	195,716	168,822	442,834	18,209	142,053	46,280	123,918	143,398	2,329,925
Per cent. of cars in shop	5.93	5.58	8.93	6.63	9.33	5.95	7.08	7.15	6.18	5.79	4.65	6.58
No. of freight engines owned	1,446	10,431	3,075	3,455	2,892	6,985	545	2,887	891	2,806	2,192	37,605
Average cars on line per freight engine owned	69	67	82	57	58	63	33	49	52	44	65	62
Total freight car mileage	57,221,052	507,554,293	143,097,285	137,229,885	120,762,273	320,794,681	25,048,593	98,151,944	38,810,443	117,739,228	109,033,494	1,675,443,671
Average mileage per car per day	19.0	24.3	18.6	23.4	23.9	24.0	46.9	24.3	28.0	31.6	25.3	24.0
Per cent. loaded mileage	74.4	67.9	72.5	65.9	69.9	70.7	69.9	66.3	62.6	68.7	76.0	69.4
Ton-miles of freight, including company freight	688,182,503	8,398,548,693	2,254,270,152	2,038,172,416	1,719,395,395	3,645,088,117	366,755,812	1,393,978,254	465,905,183	1,649,925,567	1,800,766,240	24,420,988,332
Average ton-miles, including company freight:												
Per car-mile	12.0	16.5	16.7	14.9	14.3	14.8	15.0	14.2	12.0	14.3	16.5	15.4
Per loaded car-mile	16.2	24.4	23.0	22.5	20.5	20.8	20.9	21.7	19.2	20.8	21.7	22.2
Per car per day	229	402	310	347	343	354	705	346	336	451	419	369
Gross freight earnings	$7,525,204	$49,276,562	$13,211,214	$12,707,938	$11,719,194	$32,585,952	$2,778,757	$11,062,306	$3,878,686	$16,600,515	$11,439,691	$172,786,019
Average daily earnings: Per car owned	$2.79	$2.40	$2.00	$2.24	$2.28	$2.56	$5.00	$2.50	$4.12	$4.08	$2.83	$2.56
Per railroad car on line	2.59	2.49	1.82	2.24	2.46	2.53	5.60	2.82	3.08	4.87	2.72	2.60
All cars on line	2.50	2.37	1.75	2.16	2.31	2.45	5.09	2.69	2.79	4.48	2.66	2.48

*Denotes deficiency.

Car Location on July 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	87,932	680,443	272,455	202,858	172,691	460,799	17,148	152,814	33,320	131,987	136,105	2,348,552
Home Cars on Home Roads	43,467	402,543	108,869	105,328	90,288	320,875	5,748	85,397	15,421	77,121	95,044	1,350,101
Home Cars on Foreign Roads	44,465	277,900	163,586	97,530	82,403	139,924	11,400	67,417	17,899	54,866	41,061	998,451
Foreign Cars on Home Roads	51,124	287,061	200,117	73,874	63,212	164,392	8,300	63,718	24,763	50,668	43,296	1,030,525
Total Cars on Line	94,591	689,604	308,986	179,202	153,500	485,267	14,048	149,115	40,184	127,789	138,340	2,380,626
Excess or Deficiency	6,659	9,161	36,531	*23,656	*19,191	24,468	*3,100	*3,699	6,864	*4,198	2,235	32,074
Surplus	1,265	9,953	4,660	5,182	2,322	14,257	552	12,885	2,495	17,148	5,561	76,280
Shortage	111	522	812	1,565	614	1,074	784	385	163	416	429	6,875
Shop Cars—												
Home Cars in Home Shops	5,522	42,072	18,689	12,786	15,853	25,462	683	10,939	2,686	5,189	4,776	144,657
Foreign Cars in Home Shops	1,435	8,867	7,705	2,482	1,933	4,838	546	2,481	1,040	2,639	586	34,552
Total Cars in Shops	6,957	50,939	26,394	15,268	17,786	30,300	1,229	13,420	3,726	7,828	5,362	179,209
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	49.43	59.16	39.96	51.92	52.28	69.63	33.52	55.88	46.28	58.43	69.83	57.49
Total Cars on Line	104.40	101.35	113.31	88.34	88.89	105.31	81.92	96.26	120.60	96.82	101.64	101.37
Home Cars in Home Shops	6.28	6.18	7.34	6.30	9.18	5.92	3.98	7.16	8.06	3.93	3.51	6.29
Foreign Cars in Home Shops	1.21	1.31	3.03	1.23	1.12	1.13	3.19	1.49	3.12	2.00	.43	1.50
Total Cars in Shops	7.49	7.49	10.37	7.53	10.30	7.05	7.17	8.65	11.18	5.93	3.94	7.79

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907-1913.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JUNE, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Arizona Eastern	367	$165,696	$41,266	$223,210	$103,361	$30,647	$3,252	$59,435	$9,581	$206,276	$16,934	$40	$11,794	$5,180	$81,667
Butte, Anaconda & Pacific	90	88,053	12,966	111,019	—5,372	24,768	646	45,776	4,064	69,882	41,137	.....	2,000	39,137	34,959
Carolina, Clinchfield & Ohio	247	186,960	17,076	208,314	12,545	28,058	7,051	38,709	11,667	98,030	110,284	.....	11,671	98,613	—3,925
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	8,620	1,218	10,054	772	84	1,673	2,853	1,833	7,215	2,839	.....	1,807	1,032	—2,861
Chesapeake & Ohio Lines	2,333	2,313,996	534,779	3,060,498	530,207	372,191	58,884	971,735	63,128	1,996,145	1,064,353	13,167	127,158	950,362	—116,930
Chicago, Rock Island & Pacific	7,573	3,351,882	1,667,572	6,137,476	854,932	770,816	158,136	2,145,651	131,945	4,061,480	2,071,996	—2,448	237,962	1,831,586	—671,458
Chicago, Terre Haute & Southeastern	351	122,578	16,270	142,830	24,140	20,286	3,290	55,898	9,290	112,904	29,926	—193	10,000	19,733	5,358
Cincinnati, Hamilton & Dayton	1,015	678,526	140,047	931,268	117,027	163,894	20,518	440,843	19,795	762,077	169,191	.....	40,757	128,434	84,899
Cincinnati Northern	245	97,642	18,741	122,935	25,483	18,649	2,830	48,740	3,766	99,468	23,467	.....	5,500	17,967	15,902
Cleveland, Cincinnati, Chic. & St. Louis	2,014	1,880,836	750,346	2,888,945	534,501	597,513	63,690	1,263,335	70,840	2,529,879	359,066	2,925	103,800	258,191	—227,148
Colorado & Southern	1,127	541,262	125,835	686,992	107,441	174,427	13,571	213,277	21,703	530,419	156,573	—1,759	29,175	125,639	14,286
Denver & Rio Grande	2,560	1,301,473	486,093	1,873,090	432,970	395,680	43,448	535,651	53,897	1,461,646	411,444	2,102	72,000	341,546	—186,189
Denver & Salt Lake	215	66,051	37,975	108,713	20,948	18,533	5,295	29,701	5,784	80,261	28,452	.....	3,762	22,690	2,527
Detroit & Toledo Shore Line	79	125,091	.....	125,511	11,557	7,713	1,247	31,859	2,513	54,889	70,622	.....	5,945	64,677	1,888
Detroit, Toledo & Ironton	441	112,583	13,138	137,407	42,957	100,372	2,443	75,329	5,811	226,912	—89,505	11	5,935	—95,429	—119,407
Duluth & Iron Range	272	1,021,294	23,817	1,052,769	125,245	68,328	1,086	199,233	10,632	404,524	648,245	10,422	64,885	593,782	56,738
Duluth, South Shore & Atlantic	628	221,219	96,789	342,642	83,141	38,792	12,243	115,325	8,054	257,555	85,087	1,459	21,711	64,835	35,313
Galveston, Harrisburg & San Antonio	1,338	566,248	244,791	861,420	116,254	172,423	36,247	458,268	38,710	821,902	39,518	—5,631	25,472	8,415	—30,311
Gulf & Ship Island	308	131,969	35,228	180,725	21,329	34,646	3,159	54,488	8,313	121,935	58,790	.....	9,136	49,654	32,226
Hocking Valley	352	590,612	76,710	723,501	52,266	110,835	8,840	215,350	16,135	403,426	320,075	.....	52,800	267,275	14,880
Illinois Central	4,763	3,519,279	1,104,450	5,312,982	534,218	1,203,857	105,225	1,860,014	122,744	3,827,058	1,485,924	—2,319	256,301	1,227,304	110,550
Lehigh & Hudson River	97	137,229	3,905	171,665	31,511	19,247	1,504	65,780	4,207	122,249	49,416	.....	4,067	45,349	5,737
Lehigh Valley	1,439	3,156,597	466,180	3,743,478	510,495	710,176	96,144	1,192,939	100,898	2,610,652	1,132,826	—78,426	119,705	936,695	—709,206
Louisiana & Arkansas	255	98,872	22,387	119,047	28,159	19,821	2,392	35,561	5,750	91,683	27,364	.....	4,166	23,198	—25,209
Louisiana Western	208	114,610	61,855	186,693	24,388	41,349	8,277	58,104	6,375	138,493	48,200	1,044	7,405	41,839	19,219
Midland Valley	373	67,579	40,584	114,590	32,996	33,297	2,670	41,666	5,670	116,299	—1,709	43	6,205	—7,871	—5,870
Morgan's La. & Tex. R. R. & S. S. Co.	404	202,851	95,316	338,598	68,566	61,890	15,189	161,783	15,033	322,461	16,137	2,776	17,718	1,195	116,868
Nashville, Chattanooga & St. Louis	1,231	725,776	268,056	1,068,182	246,047	208,610	40,684	396,500	29,634	921,475	146,707	—128	21,719	124,860	—88,425
New Orleans & North Eastern	196	262,560	54,334	340,393	31,528	86,948	10,614	126,266	12,280	267,636	72,757	26	11,766	61,017	9,865
New Orleans, Mobile & Chicago	404	124,713	30,251	166,074	24,411	19,956	3,884	76,491	9,722	134,464	31,610	—416	7,406	24,158	—17,187
New Orleans, Texas & Mexico	286	73,902	16,138	96,301	—5,944	39,210	3,411	54,099	7,214	97,990	—1,689	.....	1,436	—3,125	30,175
New York, Ontario & Western	566	614,317	162,486	816,012	99,507	104,586	13,216	282,840	16,326	516,475	299,537	—10,549	26,926	262,062	34,554
New York Central & Hudson River	3,750	5,663,380	3,287,891	9,962,558	1,604,197	1,846,126	191,009	3,405,463	287,457	7,335,142	2,627,416	1,123	536,788	2,091,751	—143,121
New York, Susquehanna & Western	154	147,081	47,852	226,738	32,642	18,576	1,911	98,448	7,498	159,075	67,663	8,372	6,680	69,355	6,563
Norfolk & Western	2,035	3,199,476	415,319	3,742,889	492,067	747,211	60,939	1,172,031	71,435	2,543,683	1,199,206	15,202	122,000	1,092,408	36,353
Northwestern Pacific	401	115,079	215,966	352,850	51,619	39,504	4,646	119,885	13,402	229,056	123,794	.....	12,866	110,928	39,019
Oregon Short Line	1,975	1,103,604	458,002	1,708,641	202,910	130,956	30,039	419,463	46,012	829,380	879,261	—1,190	109,865	768,206	5,570
Oregon-Washington R. R. & Nav. Co.	1,917	893,114	502,002	1,491,550	253,453	166,257	49,544	472,346	53,980	995,580	495,970	—9,745	122,983	363,242	99,111
Pecos & Northern Texas	482	124,658	37,098	172,774	22,413	38,666	3,539	65,020	7,124	136,762	36,012	.....	2,450	33,562	21,093
Peoria & Eastern	352	197,172	59,800	291,724	65,046	45,450	4,241	113,608	6,802	235,147	56,577	.....	10,400	46,177	—19,254
Pere Marquette	2,330	861,628	322,127	1,309,768	396,483	273,797	38,263	524,770	39,830	1,273,143	36,625	—6,170	32,764	—2,309	—219,441
Pittsburgh & Lake Erie	223	1,514,989	153,977	1,735,242	172,529	313,423	8,717	398,737	29,079	922,485	812,757	—61	49,700	762,996	—82,502
Pittsburgh, Shawmut & Northern	279	151,396	8,628	162,484	30,596	43,636	1,072	56,700	5,746	137,750	24,734	.....	1,590	23,144	896
Rutland	468	175,232	104,822	323,455	45,430	75,200	10,059	123,458	8,096	262,243	61,212	.....	16,613	44,599	—30,615
St. Joseph & Grand Island	319	77,623	30,984	121,425	28,615	12,413	4,827	55,051	6,536	107,442	13,983	—1,361	6,213	6,409	7,365
St. Louis & San Francisco	4,742	2,332,559	949,867	3,518,564	314,943	547,840	79,780	1,111,473	87,318	2,141,354	1,372,210	.....	113,615	1,263,595	389,650
St. Louis, Brownsville & Mexico	518	113,848	72,514	206,313	41,995	41,973	6,373	111,485	9,424	211,250	—4,937	.....	5,500	—10,437	—3,442
St. Louis Merchants' Bridge Terminal	9	.....	929	158,680	35,521	3,918	696	80,214	5,300	125,649	33,031	.....	5,600	27,431	—2,757
St. Louis, San Francisco & Texas	244	63,440	31,831	103,976	18,066	14,494	2,794	49,088	4,992	89,434	14,542	.....	1,225	13,317	19,228
St. Louis Southwestern	906	450,529	120,744	629,274	65,306	120,021	27,615	162,505	25,227	400,674	228,600	—452	37,602	190,546	6,480
San Pedro, Los Angeles & Salt Lake	1,135	556,294	287,026	941,128	119,180	127,553	34,641	283,241	19,166	583,781	357,347	—771	43,899	312,677	—29,509
Southern Kansas of Texas	125	71,073	14,678	90,610	—3,344	21,011	2,096	29,798	3,854	53,415	37,195	.....	7,318	29,877	—2,667
Tennessee Central	294	87,776	39,105	134,735	29,171	13,008	5,500	45,212	6,981	99,872	34,863	.....	4,035	30,828	—1,106
Terminal R. R. Ass'n of St. Louis	34	.....	2,260	230,565	31,001	10,259	908	86,257	31,325	159,750	70,815	11,395	25,560	56,650	—3,559
Texas & New Orleans	458	248,254	102,315	371,216	95,580	61,882	8,868	153,544	13,028	332,902	38,314	—1,002	13,138	24,174	17,273
Toledo & Ohio Central	443	513,646	55,044	601,866	85,795	92,854	6,863	182,768	10,246	378,526	223,340	—1,113	24,335	197,892	2,538
Toledo, Peoria & Western	248	77,779	39,832	131,208	22,040	19,783	2,687	48,219	3,588	96,317	34,891	.....	5,486	29,405	9,317
Toledo, St. Louis & Western	451	3,715,576	358,932	4,335,167	542,644	565,563	162,989	1,521,208	107,853	2,900,257	1,434,910	.....	179,505	1,255,405	235,576
Trinity & Brazos Valley	463	85,168	42,990	136,071	85,509	37,754	10,274	90,084	10,077	233,698	—97,627	.....	4,000	—101,627	—28,121
Vicksburg, Shreveport & Pacific	171	67,242	46,225	124,386	21,863	27,412	3,814	45,459	4,978	103,526	20,860	—72	6,500	14,288	—12,547
Virginia & Southwestern	240	127,638	14,281	145,809	24,935	29,010	2,187	41,429	4,877	102,438	43,371	.....	7,232	36,139	—16,465
Virginian	503	425,503	47,100	485,813	58,334	77,663	5,452	110,499	8,747	260,695	225,118	6,681	20,800	210,999	71,788
Yazoo & Mississippi Valley	1,373	557,362	199,066	817,056	80,455	115,218	15,497	370,544	23,535	642,249	174,807	64	59,492	115,379	3,596

REVENUES AND EXPENSES OF RAILWAYS.

TWELVE MONTHS OF FISCAL YEAR, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Arizona Eastern	367	$2,076,266	$467,849	$2,692,035	$431,136	$235,535	$31,875	$679,786	$102,172	$1,480,504	$1,211,531	$984	$115,937	$1,096,578	$258,630
Butte, Anaconda & Pacific	90	1,079,014	133,438	1,330,940	133,891	265,193	8,449	631,110	36,532	1,075,175	255,765	.....	24,689	231,126	49,506
Carolina, Clinchfield & Ohio	247	2,244,831	183,229	2,480,396	171,154	259,662	82,918	434,608	105,267	1,053,609	1,426,787	.....	99,671	1,327,116	228,565
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	132,589	18,874	154,239	10,671	1,049	13,845	32,366	7,090	65,021	89,218	.....	7,307	81,911	6,021
Chesapeake & Ohio Lines	2,333	27,549,696	5,858,138	35,085,278	4,342,745	7,275,439	669,016	11,380,998	783,362	24,451,560	10,633,718	46,079	1,375,863	9,303,934	—1,341,096
Chicago, Rock Island & Pacific	7,573	43,940,946	19,080,164	67,968,961	9,509,079	9,715,722	1,874,979	27,539,337	1,677,461	50,316,578	17,652,383	—183,411	2,857,693	14,611,279	487,837
Chicago, St. Paul, Minneapolis & Omaha	1,744	10,857,207	4,984,595	16,993,004	2,208,294	2,188,946	348,515	6,746,791	394,915	11,887,461	5,105,543	—4,811	832,263	4,268,469	386,838
Chicago, Terre Haute & Southeastern	351	1,671,112	210,816	1,929,551	332,289	402,569	37,308	634,029	95,435	1,501,630	427,921	—2,834	120,000	305,087	—120,858
Cincinnati, Hamilton & Dayton	1,015	7,384,784	1,609,544	10,071,297	1,241,461	1,876,585	234,241	4,477,247	232,456	8,061,990	2,009,307	.....	430,419	1,578,888	—531,506
Cincinnati, New Orleans & Texas Pacific	337	8,078,157	1,848,423	10,445,169	1,057,059	2,429,958	281.571	3,030,545	237,349	7,036,482	3,408,687	—7,877	345,600	3,055,210	60,946
Cincinnati Northern	245	1,130,106	211,663	1,416,922	261,441	297,576	31,713	585,008	40,044	1,215,782	201,140	.....	65,862	135,278	49,017
Cleveland, Cincinnati, Chic. & St. Louis	2,014	23,181,395	7,934,289	33,983,300	4,795,550	6,785,848	862,527	13,708,573	706,502	26,859,000	7,124,300	—13,367	1,243,042	5,867,891	—907,968
Colorado & Southern	1,127	6,897,810	1,395,362	8,827,773	1,166,653	2,010,570	135,829	2,624,703	265,979	6,203,734	2,624,039	—15,161	351,258	2,257,620	83,091
Colorado Midland	338	1,401,428	262,763	1,828,335	270,463	409,896	92,095	817,027	68,348	1,657,829	170,506	—4,433	95,477	70,596	—108,080
Cumberland Valley	162	2,671,527	692,191	3,521,447	620,193	419,384	53,299	1,163,646	98,854	2,355,376	1,166,071	1,150	71,240	1,095,981	184,010
Delaware & Hudson Co.—R. R. Dept.	854	20,104,347	3,091,853	23,999,532	1,864,867	3,590,932	281,697	8,212,929	706,265	14,656,690	9,342,842	—72,593	602,713	8,667,536	954,105
Delaware, Lackawanna & Western	958	29,618,439	8,167,527	40,518,044	5,043,138	6,145,292	837,899	12,458,433	798,469	25,283,231	15,234,813	582,375	1,748,340	14,068,848	3,133,758
Denver & Rio Grande	2,560	18,078,140	5,299,081	24,452,965	3,545,938	4,538,251	546,432	7,738,496	678,055	17,047,172	7,405,793	—6,495	948,739	6,450,559	1,054,300
Denver & Salt Lake	215	808,790	296,390	1,156,952	201,077	205,246	28,906	392,147	60,948	888,324	268,628	.....	42,262	226,366	—28,024
Detroit & Mackinac	418	818,460	339,835	1,242,327	166,415	174,768	26,969	443,602	34,942	846,696	395,631	—3,294	103,519	288,818	45,960
Detroit & Toledo Shore Line	79	1,349,364	.....	1,354,559	145,378	76,065	14,739	375,048	28,425	639,655	714,904	.....	66,755	648,149	63,885
Detroit River Tunnel	2	.....	.....	1,285,488	28,213	34,618	.....	106,918	981	170,730	1,114,758	.....	61,508	1,053,250	—45,061
Detroit, Toledo & Ironton	441	1,391,374	151,770	1,673,286	422,046	469,201	31,723	859,466	64,395	1,846,831	—173,545	.....	68,869	—242,414	—362,627
Duluth & Iron Range	272	6,750,768	263,164	7,121,719	891,543	679,920	11,601	1,597,448	143,596	3,324,108	3,797,611	26,233	361,961	3,461,883	117,821
Duluth, Missabe & Northern	356	7,946,030	442,283	8,476,104	967,089	979,656	25,007	1,676,713	154,893	3,803,358	4,672,746	29,095	423,266	4,278,575	549,884
Duluth, South Shore & Atlantic	628	2,252,869	972,525	3,412,832	716,712	411,864	119,642	1,358,579	117,693	2,724,490	688,342	4,672	219,625	473,389	—69,866
El Paso & Southwestern	982	7,126,209	1,151,938	8,657,716	1,039,279	1,161,259	175,735	2,420,385	321,625	5,118,283	3,539,433	—35,653	378,952	3,126,828	348,954
Elgin, Joliet & Eastern	824	12,385,212	132	13,350,782	1,415,968	2,051,942	60,341	3,771,064	212,180	7,511,495	5,839,287	.....	404,905	5,434,382	1,140,232
Erie	1,988	40,120,601	9,473,473	53,971,813	5,372,851	9,619,241	1,201,739	18,058,645	1,126,909	35,379,385	18,592,428	—314,299	1,768,396	16,509,733	2,961,819
Florida East Coast	642	2,452,214	1,914,798	5,037,056	770,841	706,791	92,189	1,837,346	147,436	3,554,603	1,482,453	—15,261	214,519	1,252,673	129,379
Fort Worth & Denver City	454	3,510,915	1,564,159	5,334,556	598,395	981,396	84,727	1,906,263	174,624	3,745,405	1,589,151	—9,643	128,920	1,450,588	—20,584
Galveston, Harrisburg & San Antonio	1,338	8,217,538	3,200,942	12,065,517	1,308,723	2,470,656	409,846	5,005,150	377,161	9,571,536	2,493,981	—45,627	368,085	2,080,269	283,521
Grand Rapids & Indiana	578	3,291,036	1,786,971	5,519,074	777,463	919,817	139,532	2,343,055	190,195	4,370,062	1,149,012	586	285,064	864,534	—1,350
Great Northern	7,752	58,426,236	15,158,588	78,654,591	12,321,241	9,361,317	1,242,553	21,473,238	1,430,291	45,828,640	32,825,951	121,523	4,276,898	28,670,576	3,491,235
Gulf & Ship Island	308	1,548,699	411,903	2,110,542	285,671	376,939	34,158	563,591	99,639	1,359,998	750,544	.....	87,284	663,260	96,914
Gulf, Colorado & Santa Fe	1,596	9,863,758	2,993,363	13,701,533	2,418,285	2,129,057	299,985	5,207,818	410,851	10,195,996	3,505,537	.....	469,628	3,035,909	753,514
Hocking Valley	352	6,365,735	929,991	7,817,644	781,109	1,595,266	106,384	2,332,475	168,609	4,983,843	2,833,801	.....	477,900	2,355,901	45,452
Illinois Central	4,763	42,589,299	13,455,884	64,280,903	8,519,025	13,952,654	1,320,583	24,743,324	1,513,325	50,048,911	14,231,992	—77,593	2,903,551	11,250,848	3,438,129
Indiana Harbor Belt	105	.....	.....	3,232,225	389,744	387,268	32,026	1,422,550	83,335	2,314,923	917,302	21,466	66,554	872,214	186,947
International & Great Northern	1,160	8,074,686	2,464,156	11,260,565	1,472,197	1,557,565	319,664	4,796,525	381,529	8,527,480	2,733,085	—21,013	340,000	2,372,072	.....
Kanawha & Michigan	177	2,858,751	372,311	3,303,229	478,269	641,445	28,823	958,671	78,211	2,185,419	1,117,810	—60	106,262	1,011,488	—15,573
Kansas City Southern	827	7,955,386	1,694,580	10,706,309	1,024,840	1,344,625	315,868	3,661,311	400,513	6,747,157	3,959,152	.....	465,339	3,493,813	964,162
Lake Erie & Western	906	4,843,415	888,375	6,062,327	894,907	1,138,283	143,302	2,315,277	141,100	4,632,819	1,429,508	.....	247,269	1,182,239	158,620
Lake Shore & Michigan Southern	1,872	39,376,127	12,504,785	58,272,052	7,148,005	10,363,122	1,020,739	18,965,468	1,046,283	38,543,617	19,728,435	172,036	1,831,098	18,069,373	1,770,859
Lehigh & Hudson River	97	1,712,366	47,563	1,849,436	238,945	261,941	16,023	672,859	52,840	1,242,608	606,828	.....	48,067	558,761	44,334
Lehigh Valley	1,439	36,725,138	4,867,554	43,043,372	5,694,422	7,561,271	982,858	13,993,617	875,652	29,107,820	13,935,552	—280,210	1,447,205	12,208,137	1,625,703
Long Island	399	3,462,813	7,552,985	11,641,883	1,555,766	1,320,191	170,288	5,010,386	301,397	8,358.028	3,283,855	514,867	717,822	3,080,900	310,251
Louisiana & Arkansas	255	1,375,538	243,981	1,673,459	270,644	254,707	29,287	444,873	60,207	1,059,718	613,741	.....	50,235	563,506	76,066
Louisiana Ry. & Navigation	351	1,476,056	291,604	1,891,824	279,162	241,866	71,423	753,999	78,978	1,425,428	466,396	.....	59,505	406,891	557
Louisiana Western	208	1,501,219	708,520	2,315,374	281,762	424,196	88,384	709,848	68,866	1,573,056	742,318	958	90,653	652,623	190,382
Louisville, Henderson & St. Louis	200	775,422	371,884	1,231,482	304,931	165,858	52,653	467,972	38,000	1,029,414	202,068	3,117	43,348	161,837	—99,230
Maine Central	1,206	7,126,071	3,511,171	11,331,406	1,792,298	1,646,418	132,519	4,330,613	345,150	8,246,998	3,084,408	—40,394	548,621	2,495,393	72,784
Michigan Central	1,817	23,018,013	8,795,392	35,379,498	4,199,116	5,170,762	801,007	14,110,794	624,524	24,906,203	10,473,295	17,251	1.366,985	9,123,561	570,326
Midland Valley	373	951,078	479,056	1,511,166	375,462	279,158	31,415	511,379	69,019	1,266,433	244,733	8,537	71,840	181,430	—82,258
Minneapolis & St. Louis	1,586	7,283,061	1,865,958	9,707,004	1,249,821	1,208,865	215,797	3,784,632	248,273	6,707,388	2,909,616	—363	382,242	2,617,011	1,173,709
Minneapolis, St. Paul & Sault Ste. Marie	3,976	23,485,675	6,598,443	31,763,787	3,486,089	3,978,976	647,055	10,096,355	682,782	18,891,257	12,872,530	127,618	1,764,124	11,236,024	2,316,991
Missouri, Kansas & Texas System	3,817	20,912,978	9,402,967	32,346,258	4,637,748	4,100,819	755,120	12,255,845	1,058,880	22,808,412	9,537,846	—55,625	1,287,903	8,194,318	2,308,955

Dermott, Ark., to New Orleans, La., when for export, was not unreasonable. (28 I. C. C., 215.)

Rates on Cotton Piece Goods Reduced.

John Taylor Dry Goods Company et al, v. Missouri Pacific et al. Opinion by Commissioner Prouty:

The complainants ask for a carload rating upon cotton piece goods originating in New England and the south for the transportation from points on the Mississippi river to points on the Missouri river. The commission decided that to establish a carload rating here and not elsewhere would be to throw out of balance the relation between rates on this important commodity in all parts of the country. There are good reasons why cotton piece goods should be given a carload rating, but if this is to be done it should be in some more comprehensive way than by an order in the present proceeding. The prayer was denied.

The present any-quantity rate of 35 cents per 100 lbs. upon cotton piece goods originating in New England and the south for the transportation from points on the Mississippi river to points on the Missouri river is unjust and unreasonable to the extent that it exceeds 32 cents.

Rates on cotton piece goods to Sioux City, Iowa, from Southern mills seem to be somewhat higher than those to other points upon the Missouri river. The same reduction should be made to Sioux City in all cases as is made to other Missouri River points.

Reparation should be awarded complainants in amount of the difference between the 35-cent rate and the 32-cent rate on their shipments of cotton piece goods since December 31, 1911, only, the date of the commission's decision in the *Warnock case,* 21 I. C. C., 546.

The complainants contend that, under the tariff of October 26, 1910, they are entitled to reparation in the amount of the difference paid under the 35-cent rate and the 30-cent rate, but that contention is denied, because the claim is not based upon the reasonableness of the rate charged. It involves simply a question of tariff construction. *Wheeler & Motter case,* 20 I. C. C., 141, cited and followed. (28 I. C. C., 205.)

STATE COMMISSIONS.

C. C. Witt, for the past two years engineer for the Public Utilities Commission of Kansas, has resigned to accept a position with the Interstate Commerce Commission. T. J. Strickler succeeds Mr. Witt.

The new Public Service Commission of Pennsylvania, the establishment of which was noticed last week, has appointed John P. Dohoney investigator of accidents, and George A. Woods, marshal. The commission has already taken up some of the unfinished business in the office of the former railroad commission, and has issued a decision in a car demurrage case; but no other permanent appointments have thus far been made.

The governor of Maine has issued a proclamation declaring that the general election to decide on the public utilities act of the state will not be held until September, 1914; which means that the present railroad commission of Maine will continue until that time. In the proclamation Gov. Haines emphasizes what he considers the good points of the law, and urges the people of the state to give it their soundest and best consideration before voting it down.

UNION STATION FOR DELHI, INDIA.—The government of India has issued the reports of the Delhi town-planning experts. Dealing with communications the committee discusses the question of railways, roads and tramways, and is of opinion that a complete scheme of railway arrangements, designed to serve the whole of the capital, both old and new, should be an essential feature of the layout of the city. The scheme as now drawn out provides for a new union station into which it will be possible to run every passenger train which will arrive at Delhi, whether on the 5 ft. 6 in. gage or the 3 ft. 3 in. gage. By no other means, except by such a terminal arrangement, is it possible to give to Delhi as a whole the important advantage of a central station from which all trains will depart. The scheme also provides for a short diversion of the existing Agra-Delhi chord line. This will be necessary to enable the Great Indian Peninsula and Bombay, Baroda & Central India to run into the station.

Railway Officers.

Executive, Financial and Legal Officers.

James M. Buick, secretary of the Sligo & Eastern, has been chosen president, with headquarters at St. Louis, Mo., succeeding Charles L. Rogers.

E. W. Peabody has been appointed statistician, in charge of the statistical bureau of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo.

Y. C. Campbell has been appointed claims agent of the Intercolonial Railway and the Prince Edwards Island Railway for the district from Halifax, N. S., to Sydney, with headquarters at New Glasgow, N. S.

Walter C. Noyes has been appointed general counsel of the Delaware & Hudson, with office at New York, succeeding Wm. S. Opdyke, resigned. Mr. Opdyke continues his connection with the company as a member of the board of managers.

The Colorado, Kansas & Oklahoma is the new name of the Scott City Northern, which has been reorganized with general office at Scott City, Kan. The officers of the new company are now as follows: William C. Fordyce, president, St. Louis, Mo.; Frank S. Yantis, vice-president, general manager and treasurer, Scott City, Kan.; Edward F. Goltra, vice-president, St. Louis; W. V. Delahunt, secretary, St. Louis; Wm. G. Little, assistant secretary, auditor and traffic manager, Scott City; R. L. Gurney, assistant treasurer, St. Louis, and Lee Monroe, general counsel, Topeka, Kan. The other officers retain their former positions with the reorganized company.

Operating Officers.

F. C. Dow has been appointed trainmaster of the Musselshell division of the Chicago, Milwaukee & St. Paul, with office at Miles City, Mont., succeeding A. C. Bowen, transferred.

C. E. Brooks, assistant superintendent of the Idaho division of the Oregon Short Line, has been transferred to the Montana division as an assistant superintendent, with headquarters at Pocatello, Idaho, succeeding G. L. Hickey, resigned.

W. F. Kaderly is general superintendent of both the Georgia Southern & Florida, and the Hawkinsville & Florida Southern, with office at Macon, Ga.; and he retains his position as superintendent of motive power of the Macon & Birmingham.

C. L. Titus, trainmaster of the New York, Chicago & St. Louis at Ft. Wayne, Ind., has been appointed assistant superintendent of the Buffalo division, with office at Conneaut, Ohio. O. Pierce succeeds Mr. Titus as trainmaster of the Chicago division. Effective August 15.

The Pere Marquette announces that hereafter the railroad will be divided into two districts, to be known as the Western district, with headquarters at Grand Rapids, Mich., and the Eastern district, with headquarters at Saginaw, Mich. The Western district will comprise the Chicago, the Petoskey and the Detroit divisions; J. A. Gordon is appointed general superintendent of that district, with office at Grand Rapids. The Eastern district will include the Toledo, the Port Huron, and the Canadian divisions, and W. C. Hurst is appointed general superintendent, with office at Saginaw. Effective August 11.

Traffic Officers.

Stanton Curtis, northwest passenger agent of the Southern Railway at Chicago, has been appointed assistant general passenger agent, with office at Chicago, effective September 1.

H. Brandt, district passenger agent of the Pacific Coast Steamship Company, with office at Los Angeles, Cal., has been appointed general agent, passenger department, with office at Seattle, Wash., succeeding George W. Andrews, assigned to other duties, and H. B. Brittain, city passenger agent at Los Angeles, Cal., succeeds Mr. Brandt.

C. H. Webb has been appointed assistant general freight agent of the South Texas and Louisiana lines of the St. Louis & San Francisco, embracing the St. Louis, Brownsville & Mexico, the Beaumont, Sour Lake & Western, the Oregon & Northwestern, and the New Orleans, Texas & Mexico, with headquarters at Houston, Tex.

Warner Winston Croxton, who has been appointed general passenger agent of the Atlanta, Birmingham & Atlantic, with headquarters at Atlanta, Ga., as has been announced in these columns, was born on August 25, 1880, in King William county, Virginia, and was educated in the high schools. He began railway work on June 1, 1900, with the Southern Railway, and from January of the following year to July 1902, was stenographer at Columbia, S. C. He was then for four months at Richmond, Va., and from December, 1902, to April, 1904, was secretary to the general passenger agent of the same road at Washington, D. C. From April, 1904, to October, 1905, he was traveling passenger agent of the same road at Norfolk, Va., and was then transferred in the same capacity to New York, where he remained until April, 1907, when he returned as traveling passenger agent to Norfolk, and in September, 1908, was again transferred in the same capacity to Baltimore, Md. He was appointed assistant general passenger agent of the Norfolk Southern with headquarters at Norfolk in September, 1909, and one year later was promoted to general passenger agent, which position he held at the time of his recent appointment as general passenger agent of the Atlanta, Birmingham & Atlantic, as above noted.

W. I. Jones, who on August 1 was appointed assistant to the general traffic manager of the Missouri Pacific and St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo., began railway work in 1886 as a locomotive fireman on the Iron Mountain. He was employed in that capacity until October, 1888, when he was transferred to the local office of the Missouri Pacific, and after remaining there about 15 months went to the traffic department. He left railway work in May, 1891, returning in March, 1901, as chief clerk to the assistant general freight agent of the Missouri Pacific. In November, 1906, he was promoted to commercial agent at Monroe, La., returning to the general office as chief clerk to the freight traffic manager on November 1, 1907. Mr. Jones was made assistant general freight agent in December, 1910, which position he held when recently promoted to assistant to the general traffic manager, as above noted. Mr. Jones' entire railway service has been with the Missouri Pacific system.

W. I. Jones.

Engineering and Rolling Stock Officers.

J. E. McQuillen, master mechanic of the Gulf, Colorado & Santa Fe at Silsbee, Tex., has been appointed mechanical superintendent, with headquarters at Cleburne, Tex., succeeding P. T. Dunlop, resigned.

G. A. Schmoll, district superintendent of motive power of the Baltimore & Ohio, at Wheeling, W. Va., has been appointed district superintendent of motive power, with headquarters at Pittsburgh, Pa., succeeding E. J. Searles, resigned, and J. F. Bowden, master mechanic at Newark, Ohio, succeeds Mr. Schmoll. A sketch of Mr. Bowden's career was published in the *Railway Age Gazette* of May 16, 1913, page 1111.

G. A. Schmoll, who has been appointed district superintendent of motive power of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., was born on November 23, 1862, at Fort Wayne, Ind., and began railway work in June, 1885, as an apprentice in the shops of the Pennsylvania Railroad. He later became machinist and in January, 1902, was made shop foreman, leaving that company the following November to become motive power inspector on the Baltimore & Ohio. In June, 1903, he was promoted to master mechanic at Mount Clare, and seven years later he became superintendent of motive power at Wheeling, W. Va., remaining in that position until his appointment as district superintendent of motive power at the same place, which position he held at the time of his recent appointment as district superintendent of motive power at Pittsburgh, as above noted.

J. L. Cunningham, whose appointment as master mechanic of the Philadelphia, Baltimore & Washington, with headquarters at Wilmington, Del., has already been announced in these columns, was born on September 28, 1874, at West Fairfield, Pa., and in 1891 graduated from Blairsville, Pa., High School. In November of the same year he became machinist apprentice on the Pennsylvania Railroad at Altoona, Pa., and after completing his apprenticeship, entered Purdue University, graduating with the class of 1900. In July of the same year he was appointed motive power inspector on the Pennsylvania Railroad at Philadelphia, Pa., and the following March was transferred in the same capacity to Pittsburgh. In December, 1902, he was made foreman of the Bedford division shops, at State Line, Pa., and one year later became assistant master mechanic at Harrisburg. He was appointed general foreman at Columbia, Pa., in October, 1904, and in April, 1906, was made assistant engineer of motive power at Williamsport, Pa., becoming master mechanic of the New York, Philadelphia & Norfolk in August, 1910, with headquarters at Cape Charles, Va., which position he held at the time of his appointment on July 1, as master mechanic of the Philadelphia, Baltimore & Washington, as above noted.

J. L. Cunningham.

Purchasing Officers.

H. G. Cook, whose appointment as general storekeeper of the Southern Pacific, with headquarters at San Francisco, Cal., has already been announced in these columns, began railway work, January 1, 1901, as storekeeper and roundhouse clerk for the Chicago, Rock Island & Pacific at Phillipsburg, Kan. Two years later he was transferred to Horton, Kan., where he was successively accountant, stock clerk and chief clerk in the office of the district storekeeper, until the early part of 1905. During the two years following he was employed as chief clerk in the office of the superintendent of motive power at Topeka, Kan., and again as chief clerk to the district storekeeper at Horton, leaving the Rock Island in February, 1907, to accept the position of inspector of stores with the Southern Pacific. He served in that capacity for three years and was then appointed storekeeper at Los Angeles, Cal., in February, 1910, being transferred to Sacramento, Cal., in April, 1911, to take charge of the general stores at that point. He held the latter position until his appointment on July 15 as general storekeeper, as above noted.

H. G. Cook.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The San Antonio & Aransas Pass has ordered 8 consolidation locomotives from the Baldwin Locomotive Works.

The Sandy River & Rangeley Lakes has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works.

The Hocking Valley has ordered 6 mikado locomotives and 2 ten-wheel locomotives from the American Locomotive Company.

The Erie has ordered 40 mikado locomotives from the American Locomotive Company, and 10 Pacific type locomotives from the Baldwin Locomotive Works.

The Nigerian Railways of Africa have ordered 2 six-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 14 in. x 24 in., and the diameter of the driving wheels will be 44 in., and the total weight in working order will be 71,000 lbs.

CAR BUILDING.

The New York Central Lines, mentioned in the *Railway Age Gazette* of August 1, as being in the market for about 300 passenger cars, are now definitely in the market for 204 passenger cars.

The Southern Railway has ordered 800 gondola cars and 500 box cars from the American Car & Foundry Company, and 420 gondola cars from the Mt. Vernon Car & Manufacturing Company.

IRON AND STEEL.

The Chicago, Milwaukee & St. Paul is inquiring for 70,000 tons of rails.

The Chicago, Burlington & Quincy is inquiring for 50,000 tons of rails.

The Atchison, Topeka & Santa Fe is inquiring for 30,000 tons of rails.

General Conditions in Steel.—During the past two weeks the orders received by the Steel Corporation have shown a considerable increase over the previous week. New orders are running at present at about 60 per cent. of shipments, or 10 per cent. better than three weeks ago. The railroads are beginning to enter the market again and it is expected that the orders for equipment will show a material increase in the near future.

SIGNALING.

The Pennsylvania Railroad is to install automatic block signals on its main line, Middle division, from Iroquois to Lewiston Junction, 40 miles.

The Western Maryland has given a contract to the Union Switch & Signal Company for the installation of automatic block signals on its lines through five tunnels, between Hagerstown and Cumberland, Md., and at other points on that division, aggregating 15½ miles of track.

The Baltimore & Ohio has put into operation the automatic signals which have been under construction during the past few months between McCools and La Paz, on the Chicago division of the road, 45 miles. Automatic block signals are being installed on the Cincinnati, Hamilton & Dayton, between Glenwood and Indianapolis, 48 miles, and on the Baltimore & Ohio Southwestern, between North Vernon, Ind., and Milan, 30 miles.

Fuel Oil in Roumania.—A few locomotives were converted into oil burners as long ago as 1887. In 1911, out of a total of 595 locomotives, 499 used oil for fuel. About five-eighths of the fuel is petroleum, one-eighth is coal from Cardiff and Westphalia, more than a seventh lignite, and one-tenth wood.

Supply Trade News.

William G. Bee, formerly manager of sales of the Edison Storage Battery Company, Orange, N. J., has been made a vice-president and general sales manager of that company.

The Roberts & Schaefer Company, Chicago, has received a contract from the Grand Trunk to build a 600-ton, Holmen, coaling station at St. Lambert, Que. The contract price is about $17,000.

C. R. Weaver has been made vice-president of the L. J. Bordo Company, Philadelphia, Pa., maker of Bordo blow-off valves, succeeding C. W. Allen, resigned. Mr. Allen has also resigned his position as a director of this company.

The Indiana Car & Equipment Company has recently opened a new plant at East Chicago, Ind., for building and repairing freight cars. P. H. Joyce, who is also president of the Illinois Car & Manufacturing Company, is president and treasurer of the new company, and L. J. Smith is secretary. The general offices are in the Great Northern building, Chicago.

The Stark Rolling Mill Company, Canton, Ohio, has appointed The Pedlar People, Ltd., Oshawa, Ont., its general distributors of Toncan metal sheets and products in Canada. The Pedlar People have branches at Montreal, Toronto and Winnipeg. A. T. Enlow, formerly sales manager of the Stark Rolling Mill Company, has been made manager of sales and a director of The Pedlar People, Ltd., and is also a director.

Alfred A. Pope, president of the National Malleable Castings Company, Cleveland, Ohio, died at his summer home in Farmington, Conn., on August 5. Mr. Pope was born in North Vassalboro, Me., in 1842. When he was a boy his family moved to Salem, Ohio, where he received his schooling. After several years the family moved to Cleveland, Ohio, where Mr. Pope started in business. After five or six years as a partner in the woolen manufacturing business conducted by his father and brothers under the firm name of Alton Pope & Sons, his connection with the malleable iron business began in the year 1869. This became the leading commercial interest of his life and he, associated with his partners, was foremost in developing the present process of making malleable iron and in extending its manufacture until now it has become one of the most important iron industries in the United States. Under his leadership the Cleveland Malleable Iron Company grew rapidly, until it finally became the National Malleable Castings Company. The Eberhard Manufacturing Company, Cleveland, established by Mr. Pope in 1879, was expected to produce light and special castings, but has developed into one of the largest manufactures of vehicle and saddlery hardware in the country. The Ewart Manufacturing Company, Chicago, now a part of the Link-Belt Company, originators of detachable link belting, is another of the large enterprises which grew under the management of Mr. Pope. At the time of his death, Mr. Pope was president of the National Malleable Castings Company and the Eberhard Manufacturing Company, which positions he held since the organization of those companies. He was a director in the Link-Belt Company, the North & Judd Manufacturing Company, and the Landers, Frary & Clark Company, New Britain, Conn., the Indiana & Michigan Electric Company, South Bend, Ind., the Colonial Trust Company of Waterbury, Conn., and the Century Bank of New York.

Alfred A. Pope.

Railway Construction.

ALTON & SOUTHERN.—Incorporated in Illinois with $10,000 capital, to build from a point opposite St. Louis, Mo., to a point at or near the banks of the Mississippi river in Madison county, Ill. The line is being built by the Aluminum Company of America, Pittsburgh, Pa., and it is said that about six miles have been completed. The incorporators include C. B. Fox, C. E. Hodgson and W. H. Hebenstreit, all of East St. Louis, Ill.

ANACORTES & EASTERN.—An officer writes that contracts are to be let soon to build the first section of a line from Anacortes, Wash., southeast to Laconner, thence northeast via Mount Vernon to Avon. There will be a 6,000 ft. trestle and one wooden drawbridge with a 75 ft. opening. A. D. Bower, president, and H. W. Griswold, chief engineer, Anacortes.

ATCHISON, TOPEKA & SANTA FE.—The Dodge City & Cimarron Valley has been extended from Hugoton, Kan., west to Elkhart, 33 miles. (March 14, p. 528.)

BRINSON RAILWAY.—This road has been extended from Waynesboro, Ga., northwest to St. Clair, 13 miles. (November 22, p. 1013.)

BUCTOUCHE RAILWAY & TRANSPORTATION.—The Minister of Railways for Canada has approved the location plan for the projected extension from Richibucto to Loggieville, N. B., 47 miles; but has refused to approve the plans for a line from Painsee Junction to Cape Tormentine, N. B., 42 miles. (Jan. 10, p. 87.)

BUTTE-BOISE-WINNEMUCCA.—An officer of this company, which was recently organized in Idaho with $40,000,000 capital to build a line east and west from Boise, Idaho, writes that preliminary lines have been run between Anaconda, Mont., and Winnemucca, Nev., and a section of the line near Boise, Idaho, has been finally located. The company expects to do considerable work on the line this fall. L. O. Leonard, president, Boise. (July 18, p. 131.)

CANADIAN PACIFIC.—A new line called the Kootenay subdivision has been opened for business on the British Columbia division, from Golden, B. C., south to Spillimacheen, 40 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—According to press reports, a contract has been given to the Keasal Construction Company, Tacoma, Wash., for work on the first two sections of 13 miles of the Puget Sound & Willapa Harbor, from Willapa Harbor northeast to Helsing Junction, about 47 miles. (April 25, p. 974.)

COLORADO, KANSAS & OKLAHOMA.—An officer writes that this company, formerly the Scott City Northern, expects to begin work early in October on the extension from Scott City, Kan., via Dodge City and Kinsley, to Wichita, where a connection is to be made with the Midland Valley. (August 1, p. 211.)

FRONTIER ELECTRIC.—An officer writes that this company has been organized to build an electric line on a private right of way between Niagara Falls, N. Y., and Buffalo. The necessary franchises have been secured from the city of Niagara Falls, also from North Tonawanda and Tonawanda. Nearly all the right of way has been secured and as soon as the entire right of way is secured construction work will be started. J. S. Simmons, Niagara Falls, may be addressed.

GREAT NORTHERN.—See Kettle Valley.

KETTLE VALLEY.—A contract has been given to MacArthur Brothers Company, New York, for building 38 miles of railroad in the Coquehalla canyon, B. C., to be used jointly by the Kettle Valley and the Great Northern. The work will cost over $2,000,000, and consists of considerable heavy rock work with several small tunnels. Some of the work will be sublet at once by F. C. Hitchcock, vice-president and general manager of MacArthur Brothers Company, with headquarters at Hope, B. C. (August 1, p. 211.)

LITTLE ROCK, PINE BLUFF & EASTERN TRACTION.—An officer writes regarding the construction of a line from Little Rock, Ark., southeast to Pine Bluff, 50 miles, that the company is now negotiating for franchises, also for terminal facilities, and that construction work will not be started until these matters are satisfactorily arranged. The line is to have maximum grades of 13 ft. to the mile, and over 94 per cent. of the track will be straight. E. W. Jackson, vice-president and chief engineer, Little Rock.

MINNESOTA CENTRAL (Electric).—Incorporated with $1,000,000 capital to build from Minneapolis, Minn., northwest via Robbinsdale and Champlin, to St. Cloud, about 80 miles. The line may eventually be extended north to Mille Lacs. A contract for grading the section from Robbinsdale to Champlin has been given to Petris & Smith, Osseo. E. G. Potter, president, Minneapolis; E. M. Nye, secretary, and E. M. Potter, treasurer.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The new line called the Sixth district has been opened for business on the Winnipeg division, from Fordville, N. D., west to Drake, 131.9 miles. (November 29, p. 1063.)

MONTEZUMA SAN JUAN SOUTHERN.—An officer of this company, which was organized recently in Colorado, to build via Cortez, Colo., south, to Fruitland, N. Mex., thence to Grants, about 200 miles, writes that arrangements have been made with the Ute Construction Company, St. Louis, Mo., to carry out the work. E. P. Allen, managing director of that company, will sublet the construction work. W. K. Palmer, of the Palmer Engineering Company, Kansas City, Mo., is in charge of the engineering work. G. O. Harrison, president, and Emil Stein, general manager, Cortez. (May 23, p. 1161.)

MONTOUR RAILROAD.—An officer of this company, which is a subsidiary of the Pittsburgh Coal Company, Pittsburgh, Pa., writes that work is now under way on an extension to Mingo Junction, where a connection is to be made with the Bessemer & Lake Erie, about 35 miles. (March 14, p. 529.)

NACOGDOCHES & SOUTHEASTERN.—An officer writes that the company expects to have work finished by October on the short extension of about three miles from the present eastern terminus at Dunham, Tex., east to a connection with the Angelina & Neches River, at a point about five miles west of Chireno. (March 14, p. 529.)

NEBRASKA ROADS.—According to press reports plans are being made by capitalists of Nebraska to build from Northport, Neb., southwest via Banner county, to the Pinebluff section of Wyoming. C. W. Perry, Pinebluff, Wyo., is said to be interested.

OKLAHOMA, NEW MEXICO & PACIFIC.—According to press reports, this company has given the Kenefick Construction Company the contract to build 25 miles of line westerly from Ardmore, Okla. Construction work is now under way. The old right of way of the Arkansas & Choctaw has been acquired and the first 20 miles will be easily and quickly built, as the majority of the grading has already been done. Ties and rails have been purchased and are now arriving. The main office of the company will be located at Ardmore.

ORANGEBURG RAILWAY.—This road has been completed from a connection with the Seaboard Air Line at North, S. C., southeast via Wolfton, and Raymond, to Orangeburg, which is on the Atlantic Coast Line and the Southern Railway, 17 miles, and is now open for traffic.

PENNSYLVANIA SOUTHERN.—This company will rebuild 16½ miles of line in Clarion county, Pa., and build two short branches to new coal mines. The Millcreek division will also be rehabilitated and car shops established at Clarion. The improvements will cost upwards of $200,000.

PUGET SOUND & WILLAPA HARBOR.—See Chicago, Milwaukee & St. Paul.

SAN ANTONIO, UVALDE & GULF.—The Gulf division has been extended from Kitty, Tex., south to Mikaska, 13 miles. (July 18, p. 132.)

RAILWAY STRUCTURES.

BROWNWOOD, TEX.—The Gulf, Colorado & Santa Fe has awarded a contract for the erection of new terminal buildings at this point, including a 12-stall roundhouse.

CLARION, PA.—See Pennsylvania Southern under Railway Construction.

New London, Conn.—Preliminary borings for the new four-track bridge which the New York, New Haven & Hartford is to build over the Thames river at New London are now under way and it is expected that they will be completed in about three months, when the final plans, based on the results of such borings, will be drawn. This will take possibly another six months. Like the Connecticut river bridge, the piers will be four-track piers, but only two tracks will be built at first. The cost of the bridge will be about $4,000,000. (March 7, p. 447.)

Portland, Me.—The erection of a bridge to cost $1,000,000 between Portland and South Portland is now practically assured, owing to the decision of the Portland Terminal Company (Boston & Maine and Maine Central) to pay $400,000 toward the work. The county of Cumberland will pay $500,000 as its share of the cost, and the Portland Electric Railway Company will pay $100,000. The proportionate payment of all interested parties has been a subject of legislative discussion for several years, and it was finally settled by the last legislature.

Quebec, Que.—An agreement between the city of Quebec and the Transcontinental Railway Commission regarding the location of shops at St. Malo and a passenger station at Palais, has been ratified. The estimated cost of the shops is $1,500,000, and the union station, with yards, etc., $1,700,000. The work is to be started at once and will be carried out by the Transcontinental Railway Commission, Ottawa, Ont.

Seaside, Mass.—The New York, New Haven & Hartford has let the contract for a new passenger station at Seaside on the Plymouth branch. The building will be 54 ft. by 26 ft. It will have a hard wood interior with cement floors, while the exterior will be stucco, with roof of red Spanish tile. The platform covers will be supported on ornamental stone columns. The granolithic platforms will be 400 ft. long and 8 ft. wide. The station will have waiting room, toilet room, women's retiring room, baggage room and ticket office. The grounds surrounding it will be laid out with flower beds and a circular drive. The structure is to be completed by November 1. New stations are nearly finished at Buzzard's Bay and East Bridgewater, Mass., on the same road.

Stratford, Ont.—The Grand Trunk will build a new station at Stratford at a cost of $60,000, and will also put up large express sheds. The station is to be a two-story structure of red brick, trimmed with granite with slate roofing and tile flooring. The lower floor will be used for station purposes, while the upper will be occupied by the divisional staff.

West Oregon City, Oregon.—It is reported that the Portland, Eugene & Eastern will begin work within 90 days on the construction of a machine shop and foundry.

Arica-La Paz Railway.—Reference has been made in these columns to the excessively high rates prevalent on the Aricá-La Paz Railway, and it was pointed out that if this newly completed enterprise hoped to compete successfully with the Antofagasta-Bolivia Railway it would be necessary to make a considerable cut in the rates scheduled. It is now announced that the management has reduced the established rate tariff by no less than 50 per cent. on ores from the Corocoro mining zone, consigned to the port of Arica, and 50 per cent. upon all coal carried. The company is also considering the advisability of reducing the through rate upon petroleum. These heavy reductions have not been arrived at without considerable pressure being brought to bear by the government of Bolivia, which, having originated and financed the line, naturally carries great weight with the management.

Railway Construction in Argentina.—A goodly proportion of the new construction work which has been planned and already commenced in Argentina is upon the Central Argentine system, the Buenos Ayres Great Southern system, the Argentine North Eastern and others. In regard to the first named a double track is being built between Villa Ballester and Rosario de Santa Fé, a distance of 175 miles. On the Buenos Ayres Great Southern a number of branches are being built, in connection with which outlay a fresh capital issue is to be made. The Argentine North Eastern is constructing a branch from Concordia to Concepción in the neighboring republic of Uruguay. Argentina is also being connected with Chili by a new route by way of the Lerma Valley, joining up with the Huatiquina Railway.

Railway Financial News.

Atchison, Topeka & Santa Fe.—See St. Louis, Rocky Mountain & Pacific.

Atlanta, Birmingham & Atlantic.—According to press reports this company has been declared foreclosed, after having been given a month in which to settle all outstanding obligations. The date of sale has not yet been determined upon.

Boston & Maine.—The directors have decided to pass the semi-annual dividend of 3 per cent. on the $3,149,800 preferred stock due September 1.

Buffalo & Susquehanna.—Judge Ormerod has entered a decree of foreclosure directing the sale of this company. W. F. Dubois, of Coudersport, Pa., was appointed special master to make the sale of the railroad in Pennsylvania.

Manistee & Grand Rapids.—This line, which runs from Manistee, Mich., to Marion, 77 miles, and from Dighton to Hartwick, 5 miles, will be offered at auction on September 10. The upset price will be $250,000.

National Railways of Mexico.—The directors have decided to pass the semi-annual dividend of two per cent. on the $28,831,000 first preferred stock, due August 10.

New York, New Haven & Hartford.—The stockholders will vote on August 22 on the question of authorizing an issue of $67,552,400 debenture bonds. This issue has already been subscribed for twice over.

Paragould Southeastern.—See St. Louis Southwestern.

Philadelphia, Baltimore & Washington.—The Public Service Commission of Maryland has sanctioned the proposed purchase of the Sparrows Point Railroad by this company from the Pennsylvania Steel Company for $1,400,000. The Sparrows Point is a five-mile line built to connect the works of the Maryland Steel Company with the Union Railroad (thus connecting it with the Philadelphia, Baltimore & Washington) and also with the Northern Central, which operates it for 20 per cent. of the receipts.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The Ohio Public Service Commission has authorized this company to issue $7,000,000 4½ per cent. bonds. It was impossible for the company to float at 92 an issue of that amount bearing 4 per cent. interest, as authorized by the commission on February 24, 1913.

St. Louis, Iron Mountain & Southern.—The Missouri Public Service Commission has authorized this company to issue $28,584,500 six per cent. first and refunding mortgage 40-year bonds.

St. Louis, Rocky Mountain & Pacific.—The property of this company will be sold to the Atchison, Topeka & Santa Fe, with the exception of what pertains only to the fuel business of this company.

St. Louis Southwestern.—Stockholders will vote on October 7 on the question of leasing the Paragould Southeastern, and also guaranteeing the payment of the principal and interest of 30-year five per cent. bonds of that road under a mortgage limited to $5,000,000. The Paragould Southeastern runs from Paragould, Ark., to Blythesville, 37 miles, its stock being owned by the St. Louis Southwestern.

Sparrows Point.—See Philadelphia, Baltimore & Washington.

Union Pacific.—The subscription price to stockholders for certificates of interest in Southern Pacific stock, will be $92 per share, which includes the dividend accumulated on the stock since January 1, 1913. This makes the net price per share about $88.

Wheeling & Lake Erie.—Kuhn, Loeb & Company, and Blair & Company, both of New York, have bought at public auction, the $800,000 three year, 5 per cent. notes of the Wheeling & Lake Erie, which matured on August 1, together with all claims for interest from February 1, 1908, and the $500,000 Wabash first refunding and extension mortgage 4 per cent. bonds, deposited as collateral for the notes. The price paid was $9,863,550.